SCIENCE AND BELIEF IN GOD

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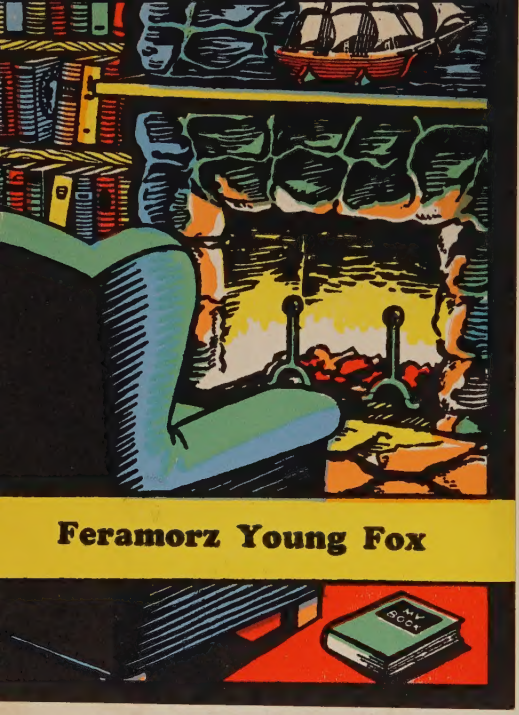

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JOHN C. STOEL
To Feramorz Y. Fox
GIFT COLLECTION
Dec. 25 1942

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SCIENCE AND BELIEF IN GOD

A Discussion of Certain Phases of Science
And Their Bearing Upon Belief
In The Supreme Being

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"Two Truths are Never at Variance"

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Dedicated to a Religion
That Enables its Adherents to Accept
All Truth

PREFATORY NOTE

The writing of this book was inspired by many years of contact with young people, in both colleges and church organizations. The discussions as they appear in the following chapters are largely an outgrowth of conversations with young people who have come to the author with questions concerning the relation of science to belief in God. No attempt has been made to prepare a closely related account of the various subjects treated, but rather to clarify a few of the principal points regarding which most of the inquiries have been made.

FREDERICK J. PACK.

SALT LAKE CITY, UTAH,
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INTRODUCTION

The theist has never made a more serious mistake than the one of assuming that the findings of science are not compatible with belief in God. This attitude, which reached its height some fifty years ago, was destructive not only to individuals but also to the church. The affects of this condition were chiefly two-fold, first, large numbers of churchmen abandoned belief in God and, secondly, many of those who retained their faith in Deity modified their conceptions of Him to such an extent that the result was practically equivalent to a denial of His existence.

Unfortunately many of these misconceptions and their resultant injuries have passed on to the present generation. The number of atheists is probably smaller than it was fifty years ago, but the disposition of ecclesiasts to make concessions to the disbeliever does not appear to be decreasing. The phase of the subject, however, in which the writer is most interested is that there still exists a marked tendency to question the harmony of theology and science.

This condition is particularly disconcerting to young people, especially those of high school and of college training, nearly all of whom have

pursued courses in which organic evolution and allied doctrines are regarded as more or less established facts. Outside of school such people are frequently confronted with the statement that these doctrines are not in harmony with the Gospel of the Master. The affect of such a condition is, of course, a highly disquieting one. It can hardly be a source of wonder, therefore, that young people often encounter difficulty in adjusting themselves to the claims of theology.

The writer's own experiences in this connection marks one of the most unpleasant periods of his life. He had been reared in a devoutly religious home and he had learned to believe implicitly in the realities of religion. Later when he attended college he came into contact with various phases of the doctrine of evolution and gradually he became impressed that the two viewpoints were not harmonious. The distress that came to him can be understood only by those who have had a similar experience. It is difficult to tell just what the outcome would have been if he had not had the good fortune to overhear one man say to another that two truths are never at variance and that in cases of seeming disagreement, difficulties always clear away when sufficient time is given to their consideration.

The writer has come into contact with hundreds of young men and young women who were passing through similar periods of temptation. They are not representative of any particular class, since they come alike from the homes of the rich and the poor, the layman and the high churchman. Some of these have lost their faith in religion; others have regained it and gone on. The toll, in any event, is far greater than the church can afford to pay, especially in view of the fact that the condition is entirely unwarranted.

The disbeliever has done all in his power to perpetuate the misunderstanding, yet the basic cause of the trouble appears to be that the theists who doubt the compatibility of science and theology fail to understand that everything in the universe is controlled by Deity and, moreover, that whenever nature performs a task it is accomplished by means of laws that respond to the will of the Creator. Instead of being derogatory to belief in the Supreme Being, the findings of science bear indisputable evidence of His existence. The following chapters have been written with the hope that some of the disturbing questions that arise in the minds of young men and young women may be at least partially answered.

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SCIENCE AND BELIEF IN GOD

CHAPTER I

SCIENCE AND DOGMATIC THEOLOGY

It is regrettable that any conflict should have arisen between two such indispensable branches of human activity as theology and science. Of all the factors that have led up to this unfortunate condition, perhaps the persistent belief of the theist that God operates by means of a series of laws independent and superior to those of nature is largely responsible. Whenever the scientist has explained the operations of Deity in terms of natural law, the theist's attitude has compelled him to interpose objections. If, on the other hand, the theist had taken the reasonable stand that the laws of nature are the laws of God, or even the neutral ground that the scriptures furnish no evidence of the manner in which Deity operates, the conflict would have been impossible.

The trouble began at a time when the theological ranks were in full power—when dogmatic theology held complete sway. Scientific explanations of the natural origin of things were denounced as heretical and wholly unscriptural.

The extremes to which this opposition was carried may be illustrated by reference to certain astronomical matters. The church had held that the sun, moon, and lesser lights were actually placed in position by the Supreme Being and that they were daily removed after the work of that particular period was completed. Opposition to this view was regarded as heresy.

The science of astronomy, as outlined by Copernicus, explained that the earth was not a flat disc, around which other bodies revolve, but that it is one of a group of spheroidal planets moving about the sun. The theist saw in this explanation, or thought that he saw, an argument against the existence of a supreme being and at once he threw the weight of his mighty influence across the path of the new doctrine. Catholics and Protestants alike pronounced the view as unscriptural and heretical.

The answer of the inquisition at Rome to the findings of the now famous astronomer, Copernicus is worthy of note: "The first proposition that the sun is the center and does not revolve about the earth is foolish, false in theology and heretical, because expressly contrary to the holy scriptures," and "the second proposition that the earth is not the center, but revolves about the sun, is absurd, false in phi-

losophy and from a theological point of view, at least, opposed to the true faith."

The attitude of the Protestant church against the findings of Copernicus is well voiced in the statement of Martin Luther: "People give ear to an upstart astrologer who strove to show that the earth revolves, not the heavens or the firmament, the sun or the moon. Whoever wishes to appear clever must devise some new system, which of all systems is of course the best. This fool wishes to reverse the entire science of theology; but the sacred scriptures tell us that Joshua commanded the sun to stand still, and not the earth."

Even Melanchthon, termed the mildest of reformers, speaks of Copernicus and his views in the following denouncetory language: "The eyes are witnesses that the heavens revolve in the space of twenty-four hours, but certain men, either from love of novelty, or to make a display of ingenuity, have concluded that the earth moves; and they maintain that neither the eighth sphere nor the sun revolves. * * * Nor, it is a want of honesty and decency to assert such notions publicly, and the example is pernicious. It is a part of good mind to accept the truth as revealed by God and acquiesce in it."

Toward the close of the eighteenth century

the ingenius Immanuel Kant gave to the world the nebular hypothesis of earth origin, and a little later Laplace reinforced it by the weight of his mathematical reasoning. Among other things the hypothesis postulates that the solar system, including the sun, planets, and satellites, "and their various movements, distances, and magnitudes, necessarily result from the obedience of nebulous masses to natural law." Immediately there arose throughout the theological world an outcry against this "atheism," and for long periods of time recurring attacks were made upon it. Even at the present time certain theists feel that the hypothesis encroaches upon the domain of theology. The opposition, however, was not raised because of any scientific inaccuracy that the hypothesis was supposed to contain, but because it involved "natural law" as the creative factor. In this attitude the theist assumed without justification that the scientist was attempting to argue Deity out of existence.

The continuous warfare that has been waged against certain geological doctrines is so well known that nothing more than allusion to them is necessary. The *time* demanded by the geologist for the creative periods has been strongly contested by certain factions in the theological world. They have argued that the

Bible specifically states the earth was created in six days of twenty-four hours each, and again, that Biblical chronology proves that the earth came into existence practically six thousand years ago.

The *method* of creation, as revealed by the geological record, which involves the operation of almost innumerable natural laws, also has been met by stubborn objection. The theist maintained that the scientist was attempting to replace Deity with "natural agencies", and that a halt to such "nefarious doctrines" should be called. Again, this was a serious mistake, since the scientist was simply trying to explain *how* the earth came into its present state; it was not his purpose to determine whether or not Deity is the directing power behind natural law.

No other phase of scientific research has been met by as much vigorous opposition as has the doctrine of organic evolution. Although the doctrine had been outlined by Lamarck in 1809, it was not until the appearance of Darwin's theory of natural selection, some fifty years later, that it seriously attracted the attention of theologians. Almost instantly the theological world arose against it, and in many respects the discussions that followed have never been equalled in point of bitterness. The doc-

trine was assailed primarily because of the fear that it was wresting Deity from the universe.

The battle with science in this case was regarded by the theist as different from, and much more serious than, any preceding ones, since former objectionable doctrines had been limited to particular phases of natural science. But organic evolution sought to explain the development of *all* life, and evolution in its broad sense encompassed everything in existence. Naturally, therefore, the theist felt that he had been forced to his last stand—that if he failed here his entire theological belief would be seriously imperiled if not destroyed.

The theist should not be criticized for opposing anything and everything that endangers his belief; in fact he would be infidel to his convictions if he did not do so. It is strange, however, and wholly inexcusable that he should attack the workings of nature on the ground that they are incompatible with the existence of a creator. Moreover, it has not been an uncommon attitude for the theist to denounce scientific doctrines without first familiarizing himself with the matters involved. On the other hand, the disbeliever has been equally as unreasonable—but this matter will be discussed more fully in another place.

The theist could have avoided all these conflicts if he had been willing to believe that *the laws of nature are the laws of God.* When he is asked concerning his attitude in this matter, however, he invariably asserts that God is the ruler of the entire universe, and that His handiwork can be seen in every impulse of nature, yet his statement of attitude toward science has never been wholly consistent with his actions. He has always feared the explanation of things by means of natural law; this is shown by his opposition to almost every important scientific doctrine that has been advanced. We are speaking, of course, only of the dogmatic theist.

If the theist had been willing to admit that God created the heavens and the earth in a perfectly natural manner, the controversy with Copernicus could not have arisen. The great astronomer was simply announcing to the world what he had discovered in nature. It was not his purpose to ascertain whether or not God is the moving cause behind its operations. But to the theist, with his warped conception that nature operates itself, there could be but one interpretation, "Copernicus is wrong, because God rules the universe."

Then again, the *time* demanded by the geologist for the creation of the universe, and the

manner in which it was formed, can give the theist no possible concern when he recognizes God as the designer and maker of nature, and nature as simply an expression of God's will.

What has been said of astronomy and of geology is similarly true of organic evolution. If the doctrine of organic evolution is true, it is not unreasonable to believe that *its method of operation is the manner in which God is bringing about His purposes.* If, on the other hand, the theist takes the stand that the doctrine is untrue, he places himself under the necessity of either dogmatically denying its claims or attempting to prove its scientific invalidity. Dogmatism has ever been injurious to religion. In the warfare against science its use has invariably brought a long list of regrets to the door of Christianity.

No one can rightfully argue that the theist should freely accept every scientific pronouncement. As a matter of fact, it is not the duty or the privilege of the theist to pass upon scientific findings; this function is reserved to those who are especially trained in the particular data under consideration. Conversely, the theologian is a specialist in matters relating to God. The scientist, on the other hand, has no right to pass on

theological problems. Each is an expert in his own field.

Furthermore, it would not be the part of wisdom for the theist to be too hasty in accepting scientific theories. Many of them soon become obsolete because of lack of proper foundation. If the theist were to accept as true a doctrine that later is proved to be untrue, he will be embarrassed in making the readjustment. This condition is well illustrated in the case of the great horde of popular preachers who have accepted Darwin's theory of natural selection as a self-sufficient explanation. The scientific world has recently shown this theory to have serious limitations. The theist can lose nothing by waiting for the scientist to prove or to disprove his own doctrines.

The only safety for the theist, therefore, is to take the stand that *if any given scientific doctrine is true, the handiwork of God is behind its operations,* in which case his security can never be imperiled by the final decision that science will eventually pass on its own theories. If, on the other hand, he dogmatically attacks a doctrine and events subsequently show that he was mistaken, his position is not to be envied. History affords numerous instances of this kind.

The Christian must maintain an absolute

confidence that in all matters of science, known and yet to be known, God is the author and prime mover. He must dispel all lingering fears that any new findings of science may imperil his belief in God. Quite to the contrary, he must welcome new discoveries, believing that they will afford him further manifestations of the goodness and intelligence of the Supreme Being.

The past attitude of the dogmatic theist has wrought injury to his own cause. If he had used the energy that he has expended in denouncing science for the purpose of preaching faith in God, as abundantly revealed in the book of nature, the cause of Christianity would have been greatly advanced.

Unhappily the theist's dogmatic denial of the findings of science has caused many valuable men and women to lose faith in religion. Thanks, however, to the intelligence of latter-day Christianity, much of this intolerance is passing away.

CHAPTER II

SCIENCE VS. THEOLOGY

It has been pointed out in the previous chapter that because of an unwarranted interpretation of the manner in which Deity works, the dogmatic theologian precipitated upon the Christian world an almost endless conflict. The casual observer may conclude that for a conflict that was waged so long and so bitterly there must have been some vital points of difference. But like most other disagreements, large and small, a simple misunderstanding lay at the foundation. The perspective now offered by years of time enables both sides to view the matter much more sanely than could formerly be done.

The principal steps that led up to the actual conflict may be arranged as follows:

a. The theist's statement that God created the heavens and the earth.

b. The belief on the part of the theist that there are two sets of laws—one by which God operates and one by which nature operates.

c. The scientist's statement that the heavens

and the earth were created through the operation of natural law.

d. The theist's conclusion that the statement of the scientist is equivalent to saying that there is no God.

e. The theist's declaration of war upon science.

It is clear, therefore, that the trouble arose as an outgrowth of the fact that the theologian had unwisely, and perhaps unwittingly, declared that Deity operates by means of laws that are separate and apart from those of nature. In consequence of this attitude, the theologian felt justified in attacking science as an open enemy whenever the latter explained the origin of things by means of natural law.

The attacks, however, were not limited to those initiated by the theological ranks. Individuals, often self-styled scientists, were equally as vigorous in asserting that the claims of theology had been disproved, that science had shown nature to be self-sufficient and that there is no God. The warfare almost from the beginning consisted of a series of attacks and counter-attacks. Each side perhaps was as bitter and vindictive as the other.

Far back near the beginning of the conflict a curious thing occurred. While dogmatic

theology was disclaiming against science, and while science was attempting to establish more securely the validity of its claims, a third party, quite unseen, entered the battle and arrayed itself against theology. This was *atheism.*

Atheism, which at first was a bystander, quickly saw the weakness of the theologian's position, especially in contesting the claims of science on the ground that they were opposed to the existence of Deity, and immediately seized upon the opportunity to forward its own claims. Atheism logically argued that if the theologian could be compelled to admit that the findings of science are true, the admission would be equivalent to a concession that there is no God.

The line of attack open to atheism was simple. It could enter the conflict under the guise of science, and assume the attitude already taken by the theologian to the effect that the laws of nature are *not* the laws of God. Then if it could be shown that the claims of science are founded on fact, the enemy—the theologian—would be beaten.

Soon after the conflict began the disbeliever entered, unheralded and unobserved, and from that day to the present he—the atheist—has been masquerading in the uniform of science. His chief purpose has been to reinforce the theo-

logian in his old belief that God does not operate by means of natural law and then to follow up with "natural explanations." In this respect the atheist has been remarkably successful. The theologian, almost to the present day, has failed to recognize his real enemy and has continued to direct his antagonism against science, the supposed offender.

Evidence for the statement that the theologian has never yet fully recognized his real enemy can be seen on almost every hand. Church laymen often speak suspiciously of the "findings of science", and it is not an unknown occurrence for preachers even in the pulpit to warn their people against science and its dogmas. As a matter of fact, science has never yet made a claim antagonistic to the fundamentals of theology. Such claims invariably come from atheism disguised as science.

In order to make this matter clear the purposes and domain of each of these three branches of human activity—science, theology, and atheism—will next be outlined.

Science. Science has for its purpose the finding out of natural truth, or the truths of nature. Its domain is the entire physical universe. For convenience in study, science has

been divided and subdivided into numerous groups, such as astronomical science, chemical science, geological science, biological science, etc.

The scientist himself, aside from possessing a sound technical training, must be deeply schooled in the quality of extreme honesty. He must enter the field of his choice primarily and exclusively for the purpose of finding out the truth. He must harbor no preconceptions that will in any way bias his conclusions. He must not make up his mind as to what the results of his investigation will be. He must discard no evidence. His mind must be absolutely open to *the answer that nature will provide.* If an investigator does not possess these qualifications he can never become really prominent in the field of science.

The writer knows something of the difficulty of training men into this particular attitude of mind. Even with the best of intentions, the average college student frequently lapses into periods during which he injects his own personal desires into his investigations. If it is a geological problem, he will try to prove the absence or the presence of, say, a fault, depending upon whether or not he *wants* it to be there. A large percentage of young men who fail as research scientists do so because they are

not willing, or able, to let the evidence supply the answer.

The properly equipped scientist goes into his field of research unencumbered by preconceptions. His sole object is to find out the truth, and he is not only willing but anxious that nature should give the answer, since he knows that her decision is unerring and final. The security of his attitude is apparent. Nature's answer to an inquiry can never be reversed. An illustration may help: Some time ago an old man, almost overcome by enthusiasm, entered the writer's office, and, after some demands for secrecy, announced that he had discovered a very valuable mineral deposit. The specimens that he produced appeared at first sight to offer at least partial justification for his excitement. The color, the hardness, and some of the other physical properties were not entirely out of harmony with his conclusion. But on a shelf almost over the writer's hand stood a number of reagent bottles filled with liquids. These would give answer to the final test. When that test was made the answer was "No." Room for controversy had gone; the final answer had been given and it could not be doubted.

While the integrity of the real scientist cannot be questioned, yet he may occasionally make

mistakes in matters of manipulation, judgment, etc., but his motive cannot be impugned. Not even the devout Christian could be more sincere. His enthusiasm at times amounts almost to a craze, yet, of course, he is human.

There is something strange about the fact that when the pure scientist has ascertained the truth, classified it, and published it to the world, he is through with it and ready for more. His goal seems to be reached when he learns the truth and gives it to others. He has no desire to use it for personal remuneration or gain. His only application of it is in getting more of its kind. He seeks truth for truth's sake alone. (We are not speaking of the applied scientist.)

The scientist, as such, never investigates the field of theological thought; this is entirely outside of his domain. His function is to find out how nature works, but never *by whom* it is operated. When the theologian learns this truth and applies it, the supposed warfare with science will soon terminate.

Theology. The fundamental basis for all theological thought is belief in a supreme being. The principal sources of such a belief are the revelations of God to His servants, the convictions that come from proper living, and the

findings of science. In our present discussion we are interested only in the last.

The theist takes up the information where the scientist leaves off. He examines the evidence as to *how* nature operates, and constantly keeps before himself the question of *by whom.* He does not investigate the *how* in nature; that has already been determined by the scientist. His object is to find an *intelligent force behind nature.* His researches convince him that nature is *not self-operating,* that behind all her works is the impress of a supreme being.

His chief work in this respect is to show that the findings of science argue for the existence of an intelligent creator.

Atheism. The atheist is not so widely known, although his object and his domain are equally as well defined. To him there is no God. His examination of the claims of science convince him that nature is fully self-sufficient. She needs no governing power behind her operations. To him there is no justification for belief in Deity. (The reader should take note that the atheist draws his conclusions from the same evidence that is examined by the theist, and that he arrives at a totally opposite conclusion.)

We have before us now the fundamental

differences of purpose of the three parties concerned in this discussion.

The scientist gathers the information.

The theist declares that it argues for God.

The atheist declares that it does not argue for God.

It will be necessary next to bear in mind that a scientist may be a theist or an atheist, or he may take no part in the controversy of God's existence. But, of course, a theist cannot be an atheist; in other words, an individual cannot believe *in* God and *against* God at the same time. Most of our great scientists are theists; some of them are atheists.

It is also important to bear in mind that when men argue for, or against God, they are not doing so as scientists. The instant that they enter the argument they become theists or atheists, depending upon the side taken. It should now be clear that science has nothing to say concerning the existence of God, either for or against.

We shall next see that the distinction made in these matters is not an artificial one.

When Sir Charles Lyell and others of our early geologists called attention to the fact that the great book of nature has recorded millions of years during which the earth has been in its

making, they were merely speaking of what their researches had uncovered. They had been out into the field of nature for many years; they had made careful study of what they had seen, and they had come back to tell what nature had recorded. When they had done this their work as scientists was completed.

Next came the application of these truths to the controversy of God's existence. Certain individuals, posing as scientists, but who in reality were atheists, were quick to proclaim that the findings of geology had completely disproved the existence of a supreme being.

The atheist employed the tactics he had previously found to be successful. Knowing the antipathy of the theist for natural explanations, he simply declared that science had again disproved the claims of theology, that science had shown that the earth was created naturally, and, therefore, that there is no God, and, finally, that the scriptural account of creation is absurdly untrue.

The theist threw the full weight of his power against such a sweeping statement. But in this case, as in previous ones, he mistook the identity of his opponent. He accepted what the enemy had said to the effect that science was

opposing belief in God, and, in consequence, he immediately arrayed himself against the claims of science.

One of two courses was open to the theist; he must either dogmatically deny the findings of geology with respect to the time element in creation or he must attempt to disprove them from natural sources. But in either case he would be supporting a failing cause; first, because dogmatism in such cases is never productive of good, and, secondly, because the geological evidence is overwhelmingly against him. Finally, of course, he was forced to give way. Thus the theist unwittingly carried out in every particular the program as outlined by his real enemy, the atheist, the disbeliever in God.

If the theist had been able to distinguish between the scientist and the disbeliever, the outcome would have been entirely different, since he would not have been under the seeming necessity of denying the findings of science or of otherwise opposing them, but, to the contrary, he could have used these findings to spread belief in the being whose existence he was attempting to prove.

The inability of the theist to identify his antagonist has always been a source of trouble. Of more recent years when the doctrine of evo-

lution was brought to popular attention through the contributions of Charles Darwin, the theist was again deceived into taking sides against science. The sole object of science in this matter, however, was to point out the evidences that researches had afforded. But as soon as the scientist had announced his findings, both the theist and the disbeliever assumed the attitude that the doctrine of organic evolution is opposed to belief in a supreme being.

It would bring about a revolution for Christianity if the theist could understand that just as soon as he himself attacks evolution on the ground that it is opposed to belief in God, he is in full accord with the fondest hopes of the disbeliever.

From the present viewpoint it matters very little whether or not the doctrine of organic evolution is true, but it is of supreme importance that the theist should take the stand that *if it is true, it argues for the existence of God.*

Moreover, the theist can materially strengthen his cause by more fully familiarizing himself with the teachings of this wonderful doctrine, which altogether too frequently is thought of as equivalent to the "monkey-man" idea. He will find in the doctrine of evolution many

choice evidences pointing to the dignity and power of a supreme being.

Finally, the theist must fully acquaint himself with the object and method of his real enemy, the disbeliever, the atheist, he who seldom fights in the open and almost never except under disguise. His favorite method has been to masquerade as a scientist and to make sweeping statements as to what science has proved.

The strength of the atheist, however, should not be underestimated; he cannot be overcome by indifference or disparagement. Only when the theist is more fully acquainted with the findings of science than is the atheist himself, can the latter be vanquished. Knowledge is the theist's best friend. Truth, the Gospel of Jesus Christ, has nothing to fear, since its teachings embody everything virtuous and praiseworthy, known and yet to be known.

The "Science vs. Theology" idea is a most unfortunate one.

CHAPTER III

NATURAL AND SUPERNATURAL

Certain current misconceptions concerning the relation of natural law to supernatural law seem to have had their origin far back near the beginning of God's intercourse with man. We can only remotely imagine the deep impressions that were made upon the early prophet as he listened to the voice of God or as he witnessed His appearance. The reverence and amazement that overcame the son Amram as he heard the voice of the Creator coming from the burning bush cannot of course be understood by the ordinary human being.

The manifestations of Deity to man seem to have been made in the most unexpected manner. At times His voice thundered from the heavens in tones that shook the earth, and again He Himself walked quietly upon the plains with a humble prophet. He smote cities with the strength of His wrath and He caused springs to appear in the midst of the desert.

The superiority of this Great Being could never have been in question; He was immediately regarded as infinitely above and beyond

everything earthly. In all this the early prophet was more than justified. That God is pre-eminent there can be no question; His power reaches everywhere and His intelligence is without limit.

Not only Deity Himself but the methods He employed were astounding to those who were permitted to know Him. Instead of working in ways familiar to man, He not infrequently commanded and His voice was instantly obeyed; He said the word and the thing was done.

In this connection, however, an improper inference was made. Because of God's ability to bring about His purposes in most unusual ways, man attributed to Him the power of operating *contrary to the laws of nature.* The misconception did not stop here; it even segregated the laws of nature and the laws of God. This attitude, of course, was not assumed without some seeming foundation.

Consider, for example, the case of the sons of the prophets who were building homes for themselves near Jordan. As they were felling trees, one of the men lost the head of his ax and it dropped into the water. His despairing statement that the ax was borrowed reached the sympathetic ear of the prophet Elisha who

threw a stick into the water and by the power of God the iron floated.

Then again, when the disciples of the Master were being tossed about by an angry sea, He appeared to them walking upon the surface of the water. Peter did likewise but when his faith failed he sank.

The accounts just recited explain cases in which God operated contrary to our *present* knowledge of the laws of nature. In both cases the law of gravity seems to have been disregarded, since both iron and flesh are heavier than water, and, in consequence, they should sink into it. The scriptures afford an almost unlimited number of similar instances, but even from this point of view the theist was not justified in believing that Deity works by means of a set of laws separate and apart from the laws of nature.

This opinion, however, has persisted with but slight modification to the present time, as witness the following definitions taken from the latest edition of the *Standard Dictionary.*

Natural: Having to do with objects in the order of nature; sometimes limited to physical phenomena; opposed to *supernatural;* as a natural event.

Supernatural: Existing or occurring through

some agency above the forces of nature; lying outside the sphere of natural law, whether physical or psychical.

The conception of "outside the sphere of natural law" is not compatible with God's relation to nature. Deity is the Creator of everything in the universe and, therefore, He works "within" natural law and not "outside" of it.

Man's conception, particularly in the past, of the term "natural" has included primarily only those things coming within the range of common experience. Any unusual phenomena, especially when connected with Divine manifestation, have been regarded as *supernatural*, or as occurring "outside the sphere of natural law." Analysis of the distinction that is ordinarily made between the terms natural and supernatural shows that the line of demarcation has been placed practically at the limits of the individual's comprehension. Phenomena that he could not explain were regarded by him as supernatural and those with which he was familiar, as natural. The extent to which this interpretation is held by certain Christians, even at the present time, is surprising. It is ordinarily explained that when the Master fed the multitude with an incredibly small amount of bread He called supernatural laws into play, but

the process of threshing wheat in the palm of His hand is regarded as wholly natural. In reality the only difference lies in our ability to explain the phenomena involved.

This condition can be illustrated by reference to certain educational matters. The chief function of our present-day education is increased ability to work. It trains the student to make short-cuts, and to bring into play forces of nature with which he was not formerly acquainted. Students become powerful just in proportion as they familiarize themselves with the laws of nature and utilize them. The advances made by modern civilization are directly traceable to increased intelligence. When the engineer designs a new machine, or the chemist produces a new substance, he does so simply by utilizing information with which he has become familiar. Education in its broader sense is equivalent to acquaintance with the laws of nature. The principal object of the school and the college is to provide the student with proper tools (information) and the ability to work with them. Even the glory of God is intelligence.

The conclusion is inevitable that with sufficient time at hand, man himself will eventually be able to accomplish anything he may desire.

The progress already made is remarkable. Man's familiarity with nature's laws enables him to communicate through the air from one continent to another, to reproduce the human voice ten thousand times farther than it can naturally be heard, to fly through the air at a speed greater than that of the swiftest bird, to remain beneath the surface of the water for days at a time. And yet all this is primitive in comparison with his probable ability even a hundred years from now.

A specific instance that shows the manner in which man progresses will not be out of place. Not many years ago the ordinary household ultramarine blueing was manufactured from a bluish mineral known as lapis-lazuli. The mineral was mined in much the same way as are metallic ores. As a result of various operations, the finished article was finally made ready for the market, but the selling price was naturally high because of the expensive processes involved in its manufacture.

Today synthetic chemistry is making ultramarine blueing chiefly from clay, sand, soda, and charcoal. The change in method came about wholly through increase of intelligence. Both processes involve definite laws of nature; each is just as natural as the other, but one is much more superior.

Primitive, cumbersome methods are no more natural than are advanced, improved ones. The ox-cart is no more natural than the mighty overland train, the canoe than the ocean liner, the Indian paint stick than the modern printing press. Yet if an individual of a hundred years ago could stand for a single day among us he would witness hundreds of "miracles" which to us are merely commonplace. The term natural is by no means equivalent to the term familiar, yet this is the sense in which many of our present-day theologians use it.

When we grasp the real genius of man's progress and the increase in power that naturally accompanies it, we shall begin to understand the proper relationship of Deity to nature. The Master at the Cana marriage transformed water into wine—truly a miracle now as much as then. But who is prepared to say that He used laws "outside the sphere of nature"? Students of chemistry will remember that the chief difference between water and wine is the presence of a certain proportion of carbon in the latter, a material which is everywhere abundant about us, even in the atmosphere. It is not unreasonable, therefore, to believe that by means of His advanced intelligence, the Master simply used natural laws to bring about the change.

As yet we are unable to produce bread except by planting the grain, milling the wheat, and baking the loaf. But no one who is familiar with the progress of modern synthetic chemistry would dare state that we shall always remain in this condition of helplessness. On the other hand, it is not improbable that in the course of a few years we shall be making the greater part of our foodstuffs in laboratories rather than growing them in the fields. The domain of man's intellect will eventually have no bounds. The Master at the seaside feasted the multitude on five loaves and a few small fishes. How it was done we do not know, but our ignorance does not justify us in concluding that He did it "outside the laws of nature."

It is quite natural that intelligent beings should employ advanced methods. After the harvesting machine was invented, man did not return to the scythe. The expert telegrapher does not send his messages by means of trained runners, neither does the nail manufacturer make his product with hammer and anvil. Why then, should the Master, who is all-knowing, work exclusively with primitive methods, and, in case He should fail to do so, why should we characterize His acts as supernatural—"outside the sphere of nature"?

God is the Creator of the universe; He is familiar with all its workings; He knows every part; He is master of its ingenuity and it responds to His will. When an engineer designs a machine and brings every part into working perfection, he subsequently uses the machine for the purpose for which it was designed. After the engineer made the printing press he did not continue to use the outgrown method of copying by hand. Similarly, the universe is the handiwork of Deity; it was designed for certain definite purposes. Its laws are God's laws, and when it operates, the Master Spirit is behind it.

The Creator's endless familiarity with the laws of the universe enables Him to call into action forces and processes with which, as yet, man is unacquainted. Some laws are more powerful than others, and when the one operates the other must give way. The metal flying machine is heavier than air, and when it is drawn upon by the law of gravity alone it rapidly sinks to the ground. But when a greater force is interposed —the explosive power of a high-grade petroleum distillate—it easily and quickly soars off into space. Similarly, God, by means of His infinite knowledge of nature, manipulates its various laws to bring about His purposes.

Therefore, it would be far better if we

should regard truth as *known* and *unknown*, rather than as *natural* and *supernatural*, particularly in view of the tendency to conclude that if a thing can be explained "naturally," God has nothing to do with it. In the writer's judgment a great service would be rendered Christianity if the term supernatural were expurged from all languages. Christians must insist that Deity is not only behind the familiar operations of nature but that He is all-powerful and that He frequently works by methods totally unknown to us.

The mistake, of course, must not be made that nature rules God. God is not nature, as some would lead us to believe, any more than the mechanic is the machine that he creates and operates.

The point here is that there exists a great system of universal law, natural law. Some of these laws are higher and more powerful than others. God is familiar with all of them and master of all of them. He uses them to bring about His purposes. Man, on the other hand, is familiar with only a few of them, and partially master of a still smaller number. God may operate in such a manner that man can understand His methods or He may utilize laws with which man is unfamiliar. He may work by means of

either known or unknown laws, but He is never out of harmony with law. He is a God of order and not of disorder.

CHAPTER IV.

BREADTH IN THEOLOGY

Perhaps one of the most distracting criticisms brought to bear upon the young Christian of definite religious ideas is the one accusing him of narrowness. A pronounced tendency has arisen within recent years away from fixed requirements in religion and toward a policy that permits the individual to choose his own belief. The Christian who maintains that a somewhat definite course of action is necessary to salvation is rather generally looked upon as "narrow" and probably poorly informed, while the individual who interprets theology as permitting him to do much as he may choose is characterized as "broad"—an appellation that carries with it the idea of being well-informed.

The tendency toward this indefiniteness in religious ideas is doubtless an outgrowth of the great variety of conflicting interpretations placed upon the scriptures. Preachers of apparently equal ability, after reading the same texts, not infrequently arrive at widely divergent opinions, in consequence of which, there

exists a growing impatience with fixed and specific doctrines.

An experience of the writer will help to illustrate the manner in which this condition is regarded by some of even the educated classes. While visiting at an Atlantic seaboard city some time ago, the writer accepted an invitation from a college professor to spend a week at his summer home on Long Island. The professor held a departmental chair at one of America's greatest universities, and his wife, a very amiable little woman, had become a noted writer after her graduation from a New England college.

Each night of the visit, as we sat on the lawn or the veranda, the conversation invariably turned toward religion. For hours at a time we discussed the history and achievements of various religious peoples. Both the professor and his wife were interested in the scientific and philosophic aspects of theology, and particularly in everything suggestive of progression, since they believed that man's future glorification is simply an exemplification of an expanded version of the doctrine of evolution.

While their interest in what might be termed the more philosophic aspects of theology mounted to enthusiasm, yet in all ritualistic matters they were wholly uninterested. In fact,

it almost irritated the professor to speak of such things as the necessity of baptism, or the mode of baptism, or of the imposition of hands. To him these matters were but marks of narrowness; they were remnants of medieval times when fixed ceremonies formed the principal part of religion. From his viewpoint they should be discarded, not only because they are unnecessary but because they indicate lack of progression. Twentieth century enlightenment demands a religion big enough and broad enough to admit all well-meaning people, without requiring them to submit to distasteful ceremony.

In exhibiting this attitude the learned scientist was but exemplifying a general tendency of modern times. The demands of today are almost universally for "breadth" in religion. Many of those who seek admission to the churches insist not only that they must be admitted under requirements that they themselves specify but that they may believe and act much as they choose after they become members. Churchmen regard it as a compliment to be considered "broad" and "liberal". To many of them the quality seems in some way to be associated with that of profound learning.

No one will deny that the demands for "breadth" are being met. Sectarian denomina-

tions are almost universally abandoning doctrines and ceremonies that they formerly regarded as essential to salvation. Preachers are vying with one another in the matter of "breadth", and if the present tendency continues long, the church that can offer its communicants most for the least amount of effort will easily become the most popular.

Some of these tendencies are not without their virtues. To illustrate: Doctrines that consign innocent children to an everlasting punishment are nothing short of satanical, and the ignorance of many sectarian denominations in asserting that all people except their own members will suffer endless torment is but little better. Bitterness existing between the various sects should pass away, and, of course, no sensible person will deny that Christian virtues will be rewarded wherever they are found. Moreover, if we are really the children of God, the church should be big enough to include all of us, since, other things being the same, the salvation of every child of God is equally desirable. Human beings must not (and of course cannot) be shut out from salvation merely because of form.

We shall next see, however, that "breadth" and "liberality" as applied to religion, are equivalent to "looseness" and "disregard for scrip-

tural law". The "broad" religion of today is one that makes few or no exacting requirements of its members. They may be baptized or not as they choose, and they may select any one of a variety of modes of its administration. The individual who lives a generally moral life and acknowledges Jesus as the Christ is otherwise allowed to do almost as he may elect.

There is probably no other form of human activity in which so much "liberality" is possible. The writer was at one time a graduate student in the university where our highly respected scientific friend was a professor. Entrance requirements were the most stringent. During the period of residence, the writer was required to comply strictly with the program as outlined by the authorities of the university, and immediately before graduation he sat for hours under the direct interrogation of half a score of professors. The examination included not only the work done during residence at the institution itself but that done at the undergraduate schools. Every phase of his preparation was carefully scrutinized, and not a leaf or a paragraph of his training was left untouched. After the examination had been successfully passed, the candidate was required to consult his dean on various matters, pay fees, etc.

As the writer looks back on this experience he does not see a single item that could be regarded as wholly unnecessary or perfunctory. Time, of course, will modify some of these practices, but as long as the university lasts, requirements of some such nature will be necessary. Its doors will never be thrown open and the public invited to come in and choose its own course of action.

In commercial activities, as well as in educational matters, strict adherence to law is fundamentally essential to success. The writer has in mind the greatest copper mine in the world. The occurrence of vast quantities of copper minerals had been known for many years, but the low grade of the ore seemed to make their treatment non-commercial. Finally, an engineer of unusual ability conceived the idea of working the deposit on a very large scale and thus make the narrow margins pay. His idea, now carried into effect, involves the use of scores of giant steam shovels, hundreds of especially designed railroad cars, enormous locomotives, crushers, mills, smelters, etc.

The point here is that every one of the devices and processes, as a unit and as a whole, is essential to the success of the project. Eliminate any one of the major processes and failure will

follow. The engineer's success is due to compliance with, and utilization of, law.

If the "breadth" idea of religion were applied to any phase of commendable endeavor, progress would cease. What would become of the great university and its present splendid efficiency, without its entrance, residence, and graduating requirements? Practically any one who cared to do so could enter the institution; he might present the prerequisites or he might not; he could pay the registration fee if he chose; he could attend classes or absent himself at will; and he could be graduated whenever in his judgment the proper time had arrived.

In commercial activities conditions would be equally as bad. Apply the same kind of "breadth" to the great copper plant at Bingham, Utah, and its usefulness will immediately terminate. Let it be supposed that individuals without the necessary training were set to work on the great steam shovels, in the assay offices, on the railroads, and in the mills and smelters; let it be supposed that the workmen regard any and all of the various processes as purely perfunctory and that they can be abandoned at will. No mention of what the result would be is necessary.

The illustration may at first seem extreme,

but this is really what "breadth" and "liberality" mean to religion, since the idea makes every individual a law unto himself. It is just as impossible to reap the full benefits of spiritual growth without complying with the laws that govern it as it is in scholastic or in commercial affairs.

Before an applicant is permitted to enter a university of standing, he must prove his readiness; he is admitted upon meeting certain requirements, and he is promoted only on merit. Registration is by no means equivalent to graduation.

The student in the laboratory, the musician in the conservatory, the farmer in the field, the mechanic in the shop, the physician in the college, all find it absolutely necessary to comply with law. In every field of human activity strict adherence to law is essential to success, and yet in religious activity many people believe that they can do about as they choose and still that they will reach the final goal of salvation. The attitude of such people is equivalent to stating that religion is not based upon law, and, therefore, that it is outside the realm of everything else in the universe.

Notwithstanding popular opinion to the contrary, it is just as impossible to get something

for nothing in spiritual life as it is in physical life. Growth of the spirit is fully as dependent upon compliance with law as is growth of the body. The road to any kind of perfection is a long one, marked by mile posts of honest, successful endeavor. Success in any field consists of overcoming difficulties by means of law. Efficiency involves law; inefficiency disregards law.

Admittedly a difficulty presents itself to those who desire to familiarize themselves with the laws that govern spiritual development and final salvation in the kingdom of heaven. The Holy Bible is supposed to make this matter clear, but theologians differ greatly in their interpretations. Some of them tell us, for instance, that faith in God is sufficient, while others, apparently as well informed, insist that a variety of works is also essential. The condition has bewildered the layman to such an extent that he sometimes wonders if any of the theologians know what they are talking about.

Of one thing, however, we can be sure, and that is that laws governing our spiritual development *do* exist whether or not we are familiar with them. Furthermore, before we can participate in the blessings of these laws we must familiarize ourselves with them and obey them.

The scriptures tell us that we know the things of man by the spirit of man and the things of God by the Spirit of God. Deity is the only one wholly familiar with the great scheme of saving human souls. From time to time He has revealed various laws to His servants, the prophets. What the laws actually are and to whom they have been revealed in these latter days is, of course, a matter quite outside the purposes of this chapter. There can be no question that many of the rituals and ceremonies employed by Christian churches are as "sounding brass and tinkling cymbal" and wholly unnecessary to the salvation of the soul, yet it would be entirely out of place to attempt a discrimination between them here.

No one in these days of twentieth century enlightenment would think of championing the idea of "breadth" in mathematics, in biology, or in the physical sciences. Law governs the entire universe; nothing is fortuitous. If religion is a part of God's creation, then it, too, is governed by law, and every effort to avoid it will necessarily retard human progress. The modern idea of "breadth" in religion is equivalent to believing that the salvation of the human soul is not founded on law, and, therefore, the logical con-

clusion is that the claims of religion are not based on truth.

The writer refuses to believe that the Gospel of Jesus Christ is not established on law. He believes that its requirements are equally as exacting as those governing every other phase of God's creation. He does not pretend to declare what these laws are—this matter has been left to the prophets—but that they exist is self-evident.

What has been said of "breadth" in religion does not apply to "tolerance" which, of course, is a different matter.

CHAPTER V

COMPETENT ADVISERS

It has been said that advice is given more freely than anything else in the world. When this statement is applied to matters of religion it possesses a particular significance, since almost every human being feels competent to offer suggestions relative to religion and to theology. Just why this is the case is difficult to explain, for, certainly, not every one is proficient in this respect. Because of its far-reaching effects, the readiness with which people proffer advice concerning religion is of more than passing interest, since if religion is true, it is the most important thing in the world, and counsel concerning it should be given only by those who are prepared to speak with some degree of authority.

The attitude of people generally toward this matter is not unlike that of a certain college professor under whom the writer studied several years ago. The professor possessed an attractive personality and had the ability to impress his students in such a manner that they almost immediately became his devoted followers. He was a man of thorough scientific training, yet

he was a disbeliever in God and in any form of religious worship. Even though his students came to him as devout believers in a supreme being, yet after they had been with him for a short time they often partook of his skepticism. The professor had never been a religious man and therefore he had never tested the claims of theology, yet he assumed the unwarranted role of being prepared to advise against a subject in which he had never made any practical preparation.

The writer feels that if religion is founded on fact, it is just as real and natural as any of the sciences or philosophies of modern education. Furthermore, devotees of religion are not required to live more fully by faith than are students of astronomy or of chemistry; therefore, matters of religion should be analyzed with the same degree of fairness and reason that characterize activities along other lines.

When an individual seeks advice relative to, say, some matter involving surgery, he does not go to an individual who has formed nothing more than a casual opinion, but he consults a specialist who has thoroughly familiarized himself with both theory and practice.

The matter, however, needs further elucidation. It has been learned that the development

of the human being, mind and body, is largely dependent upon environment. While there are many factors that constitute this environment, such as proper associates, food, literature, physical conditions, etc., yet, above all else, development hinges primarily upon the matter of use. An individual may be surrounded by every desirable condition, but if he does not *use* his faculties, he can never become educated. Every university in the land is discharging students because they will not work.

While it is true that a student may get some good ideas of, say, football, simply by listening to the coach's instructions, yet he can never become a real player until after he has *worked* out its theoretical aspects and *participated in* the game.

Given average faculties to begin with, *serious participation* may be regarded as a true measure of man's efficiency. This is the case in law, in music, in medicine, in engineering, in athletics, and in everything else. Development comes through application and not through idleness.

Inasmuch as the element of time will not permit an individual to participate in a wide variety of professions, custom has encouraged intensified work along chosen lines. Thus, we

have *specialists* in almost every field of human endeavor. Some devote their time to banking, some to law, some to medicine, some to teaching. In each case, barring a few disputed points, the measure of the specialist's success is the amount of *serious effort* he has devoted to his subject.

The achievements of modern civilization are largely traceable to the practice of specializing, which enables the individual to develop in some particular line far ahead of the masses. If the world should wait for the whole public to bring forward new ideas, progress would be exceedingly slow. The practice of specializing, however, makes it possible for the entire human family to profit by the researches of a single individual; in a sense, it lifts all of the human family to the level of the brightest ones among us. We are today enjoying the use of the telephone, the electric light, wireless telegraphy, and numerous other conveniences because of the efforts of a few.

The specialist is by no means a "know-it-all". Quite to the contrary, the fact that he has devoted so much of his time to one particular subject has necessarily curtailed his efforts along other lines. Men cannot become authorities by studying everything in the universe. Moreover, it does not follow that because a man is well

educated along one line, he is well educated along other lines.

The value of the specialist is almost never misapplied in connection with material things. No one would think of going to, say, a surgeon for advice concerning legal matters, or to a dry-farm specialist for suggestions relative to a mining proposition. When we need information we go to individuals who are well informed along the particular line in which we are seeking counsel.

The central question of the matter under consideration is now before us: "To whom shall we go for advice on spiritual affairs?" Unless the study of religion and religion itself are different from other matters, there can be but one answer, "We should go to specialists in religion." But who are these specialists?

As noted elsewhere, the development of spirituality is just as much dependent upon compliance with law as is physical prowess or mental acumen; furthermore, its steps are equally as well graded. The first principles of mathematics, of language, or of art are no more essential to development along these lines than are the first principles of religion to the development of spirituality. Unless the first steps are taken further progress is barred.

To illustrate: No one can become an authority in mathematics, in philosophy, or in law without first learning the letters of the alphabet and the numerals from one to ten; these are basic necessities. Similarly, no one can develop spirituality without first learning to have faith in God. Just as the learning of the numerals is followed by other tasks, so faith in God is followed by repentance of one's sins and petitions to Deity in the form of prayer.

The writer knows of a man who has never learned the letters of the alphabet, and he also knows of individuals who have never learned to have faith in God. In both of these cases the basic principles have been neglected and in both cases further progress along these lines is impossible.

Knowledge of God, like knowledge of physics or of chemistry or of anything else, may be thought of as possessing both "theoretical" and "practical" aspects. The "believer" in God never gets very far until he begins to put his convictions into practice. No one could have couched this fact more plainly than did the Master himself; "Not every one that sayeth unto me, Lord, Lord, shall enter the Kingdom of Heaven, but he that doeth the will of my Father which is in heaven".

In order to become efficient in spiritual matters, therefore, the believer must *apply* himself to the truths of the gospel. He must be industrious, fearless, and sincere. He must be willing to accept the truth when it comes to him and to incorporate it in his every-day life. The measure of his success, like that of the musician or the surgeon, is governed by the amount of intelligent and serious effort he devotes to it.

Inasmuch as spiritual development is controlled by natural law, it seems strange that many otherwise intelligent people, who have made no preparation in religious matters, are not only willing but seemingly anxious to disparage belief in the Supreme Being. It is worse than nonsense for a man who has never had faith in God, who has never prayed, to declare that such a being does not exist. The ignorance thus displayed is fully as amusing as that of a carpenter who declared in the writer's hearing that it is impossible to measure the distance from the earth to the sun. The carpenter knew nothing about the solving of trigonometrical equations; the only way he could measure distances was by means of a ruler or a tape line.

The absurdity of the situation is heightened by the fact that here and there some of the most highly educated people are willing to declare

that there is no God. Furthermore, many of the people, who thus assert themselves, have never learned the first letters of the spiritual alphabet.

God does not promise knowledge of His existence to anyone except to him that "doeth the will of the Father". This same law of "doing" holds in every field of human activity. Knowledge of science or of philosophy or of music is never obtained except by means of *working* in these particular lines.

Why then should an individual, no matter how learned he may be in other subjects, set himself up as an adviser in a field about which he knows nothing?

Such an individual may remonstrate that he *does* know something about this matter, that he *has* carefully studied its psychological and philosophical aspects, and finally that reason tells him that there is no God. But the reply, nay the answer, is that inasmuch as he has not obeyed the first principles, he is wholly incompetent to act as a judge. No one would be unwise enough to insist that an individual who has never learned the primary numerals is prepared to pass judgment upon the principles involved in quadratic equations.

An individual can never become a specialist or an adviser in any line until he has thoroughly

familiarized himself with the subject, and he must start at the bottom before he can begin to climb. This principle applies equally as well to spiritual matters as it does to any others. God's promises are everywhere predicated upon the faithfulness of the believer.

Thus we again return to the question, "To whom shall we go for advice in spiritual matters?" And again we ask the other question: "To whom shall we go for advice in matters relating to law, or to medicine, or to teaching, or to banking?" There is but one answer; "We should go to a specialist trained in the given line".

But it may be argued that those who have investigated religion are not a unit with respect to the fulfillment of its promises, that many who have prayed declare that their prayers have not been answered.

No one should attempt to deny the truthfulness of this assertion, or even that the condition is unusual. It is also true that a considerable percentage of those who investigate any calling sooner or later abandon it. Even among those who attempt to learn to read and write, thousands upon thousands annually give it up as a hopeless task.

No one could wish to dignify a novice by

regarding him as a specialist. If we did this with an individual who had prayed a few times and then had forsaken his former convictions, reason would compel us to do the same thing with the student of law or of medicine or of engineering, who in his freshman examination had failed because of any one of various reasons. Such individuals are the antitheses of specialists: they are the failures.

A religious specialist is one who is prepared to give advice in spiritual matters; he has faithfully tested out the principles involved, and knows whereof he speaks. In this respect he differs from other specialists chiefly in the nature of the material involved. He is dealing with spiritual affairs; the engineer is dealing with iron and stone. Each has reached his present stage of proficiency by continued attention to duty.

It is to the credit of true religion that those who seriously devote themselves to it never abandon it; the longer they work, the more faithful they become. Only one factor exists that can cause disciples of true religion to depart from their faith, and that is sin, or disobedience to law, which is the same thing.

The fact that the student of religion is impressed with the merits of his calling in propor-

tion to the time he devotes to it is by no means negligible evidence of its truthfulness. Scientists and others may be enthusiastic for a time concerning theories that ultimately prove to be untrue, such, for instance, as has been the case with certain theories advanced fifty years ago relative to the causes of organic evolution. True religion, on the other hand, is never abandoned by those who faithfully pursue it. The more fully its devotees abide by its teachings, the more they become convinced of its truthfulness.

It is also a fact that the longer a subject is accepted by the masses of humanity, the more securely its claims for truthfulness are thought to be established. In this respect religion takes precedence over all other lines of human thought. Even music and mathematics, the oldest of the arts and sciences, take a secondary place.

It follows, therefore, that the religious specialist, he who has truthfully devoted his life to his work, is far better prepared than anyone else to give advice in matters of religion. He has reached his proficiency only by years of devotion and industry.

Yet in matters of religion almost everyone poses as an adviser. He may be found in the poolhall, on the street, or in the college class room. Absurdity is without reason.

CHAPTER VI

RELIGIOUS DEVOTION AND ATTENDANCE AT COLLEGE

The thesis would be difficult to prove that attendance at college is frequently accompanied by a notable decrease in religious fervor, although there exists a widespread suspicion that such is the case. Almost anyone who has given the matter attention can recall cases of young people who have discontinued attendance at church soon after entering college, and, on the other hand, cases of increased devotion are few if not comparatively unknown. Experience has taught us that we can hardly expect the average college graduate, upon returning home, to be enthusiastic about religion. He usually talks more readily of his scholastic training and of the associated social activities. His interest runs high in matters relating to class functions, fraternities, scientific and philosophical theories, etc., but of religion he usually has little to say, unless perhaps in the attitude of criticising its "old-fashioned notions".

Even after settling down to his professional career, the college graduate does not appear to

regain his one time religious zeal. It is doubtful that physicians, attorneys, bankers, business men, and others who are college graduates have their proper representation at church activities. At any rate, whether founded upon fact or not, there exists a widespread conviction that college training is not conducive to religious development.

The issue at hand, however, must be plainly understood. Even if it is true that students become less religious while at college, it does not follow that the training obtained in college is necessarily responsible, in whole or in part, for the decreased devotion. The condition may be due to one or more of a large number of factors quite independent of the scholastic training, or it may be due to the training itself. The mere fact that a man may lose faith in God while studying philosophy, geology, or mathematics is not conclusive evidence that these particular branches of science foster atheistic tendencies.

Religious people themselves are not prepared to admit that the acquisition of educational truths detracts from religious truths. Quite to the contrary, the one should reinforce the other. Facts in geology and in philosophy should not, nay, cannot, antagonize facts in religion and in theology. Truth is opposed to error, and error

is opposed to truth, but truth never runs counter to truth. Religion, when properly understood, comprehends the entire system of universal truth; it encompasses everything worthy of acceptance. Hence, the religious man who possesses the proper conception of his own faith should be able to go into the field of learning and accept everything that is true. Any religion which does not possess this high standard can hardly hope to retain a membership of thinking people.

The conclusion is inevitable, therefore, that if there is any actual conflict between scientific and theological doctrines, the one or the other must be wrong. One truth cannot be incompatible with another. To the writer it would be foolishness to argue that either of these great branches of human thought is fundamentally out of harmony with fact. There may be, and probably are, errors in the non-essentials of both, but the basic principles of theology and of science have been too fully established to admit of question. It is therefore impossible for pure science when properly understood to detract from faith in God.

It may be argued by someone that theology itself contains much error and that when the college student familiarizes himself with the truths of science he gradually loses his religious

fervor. Or it may be conversely argued that the fallacies of science are responsible for the change of attitude. As a matter of fact, it is probably true, as just noted, that neither science nor theology contains in its fundamental conceptions much of anything that further experience will modify. The writer feels very strongly that the established facts of science, in their present form, are not in any way opposed to belief in God, but, quite to the contrary, that they emphatically affirm His existence. This being true, it follows that the loss of religious devotion while in attendance at college, must be due to something other than the subjects themselves.

In college life the student is subject to a great number of influences, both for good and for bad. The uplifting ones doubtless far outweigh the others. Perhaps one of the most disconcerting conditions is that the student himself does not distinguish sharply between things that have been established as true and things that are scarcely more than theories or hypotheses. The writer has heard it stated, for instance, that the geological record enables us to trace life-forms back to a unicellular origin, when, as a matter of fact, nothing of the kind has been done. The earliest forms thus far discovered were highly developed in comparison with the hypothetical

ones just mentioned. The statement instead of being founded on fact is simply the result of certain speculations, which may be true or untrue; as yet we cannot say. When proper attention is given to the matter of separating the things that are known from the things that are not known, many of the popular misapprehensions relative to the supposed conflict between science and theology will disappear.

Teachers sometimes contribute to the students' misunderstanding. It is an easy matter for a teacher to state that science has proved thus and so, when in reality he is expressing only his hope concerning the outcome of some favorite theory. Students are commonly in no position to question the truthfulness of his assertions. His mis-statement does not necessarily imply dishonesty, since he may sincerely feel that he has sufficient evidence to support his assertion; yet at the same time he may be wrong. The principal difficulty arises from the fact that he does not differentiate clearly enough between law and theory, between that which he knows and that which he thinks he knows.

Another type of danger arises from the biased instructor, he who does not believe in God and who is anxious to destroy the faith of others. Thanks to the trend of modern education, these

men are rapidly disappearing. Very few of them are now finding places in institutions of learning. Any teacher who will deliberately attempt to destroy the faith of his students is more than unworthy of his calling; he is reprobate to the trust placed in him.

It cannot be denied that certain student "functions" are deleterious to religious devotion. Week-end dances, with their not infrequent tendency to run over into Sunday morning, make very poor preparation for proper observance of the Sabbath day. "Busts," at which tobacco and even liquor are sometimes urged upon those present, are far from uplifting in their general influence. The use of profanity seems to be considered a manly art among certain classes of college men. The "good fellow" idea has a strong influence with most students, especially where it is advocated by upper classmen. Young men who can run the gauntlet of all these factors and come out unharmed are exceptions to the rule. The college atmosphere, in its entirety, however, is by no means a demoralizing one, yet, on the other hand, it is scarcely conducive to spiritual development.

Paramount among all the distracting factors, however, is the practice usually followed by students of discontinuing church activity

while in attendance at school. Inasmuch as most students are laboring under heavy expense and limited time, they naturally feel that their entire efforts should be devoted to school work. They ordinarily assume this attitude with the full intention of resuming their religious duties after graduation, but when their college work is finished and they return to practical life the old time religious fervor often fails to reappear.

Friends and parents who witness this transformation usually attribute the change to something studied at college; as a matter of fact, it is primarily due to the operation of the well-known law that disuse results in atrophy. In this matter, parents are probably even more at fault than the students themselves. Their superior experience ought to have taught them that nothing in the living world can rest without decay. Yet they expect their sons and their daughters to return to them in the full vigor of religious enthusiasm after four or more years of inactivity.

Everyone is familiar with the effect of rest. For purposes of illustration we might consider the case of, say, a violinist whose ability has been achieved through many years of study and practice. If this expert were to leave his instrument behind and enter another field of investi-

gation where matters quite aside from music formed the chief points of interest, his ability would gradually decline until finally he had lost the greater part of his enthusiasm and skill. Deterioration in musical technique is so rapid that performers usually plead "being out of practice" when they have been away from their music for even a few days.

There is no essential difference in other matters. The athlete may work himself into the pink of physical perfection, but when he discontinues training his muscles lose their responsiveness and his general efficiency quickly declines. The singer, the orator, the scientist, all suffer through inactivity. Even a race horse must be kept in training. *Nature everywhere refuses to maintain high standards unless the individual works.*

Yet in spite of all these well known facts, men and women deliberately lay aside their religious training with the belief that they can take it up again when they choose, and that they will not have lost in the meantime. The idea is fully as absurd as if it were applied to music, to athletics, to law, or to anything else. Just how an individual can hope to rest from his religious duties without suffering therefrom is difficult to understand. The fact probably is that par-

ents and others scarcely give the matter serious attention. Too many people regard religion as something fundamentally different from other affairs of life and probably not governed by the same kind of laws.

The wonder is not so much that we lose our religious faith through lack of participation, but rather we lose it so slowly. Without physical food the human body will starve to death in scarcely more than a month, but without spiritual food the soul of man may linger on for years. When compared with deterioration along other lines, it will be seen that spiritual decline is no more rapid than any other, and in many cases that it is much less so. The chief point, however, is that spiritual development always declines under conditions of disuse.

Moreover, this deterioration, decline, or apostasy, whatever we choose to call it, may come about solely through inactivity. The best men in the world, when severed from their religious associations and engaged in other lines of research, cannot but suffer because of the separation. Nature seems to have declared that rest alone is sufficient to destroy. In all matters of efficiency, high standards cannot be maintained without continuous effort.

When inactivity is aided by some other fac-

tor the impairment will be correspondingly more rapid. The athlete who resorts to alcoholic beverages during his period of rest will suffer more rapidly than if he rests only. Similarly, the inactive believer who comes into contact with poisonous influences will more quickly lose his faith than if he remains uncontaminated. But here, as elsewhere, the important point is that *inactivity alone, unaided by other distracting factors, will invariably bring about decline.*

It is doubtful that parents or students have properly estimated the danger that is attached even to the temporary abandonment of religious devotion. If they had done so, it is scarcely possible that so many college men and women would separate themselves from their church obligations. And yet, no one knows more fully than do college people themselves that relaxation of effort is everywhere followed by loss of efficiency and eventual ruin.

Of all the factors that tend to produce apathy toward religion among college men and women, lack of participation stands paramount. The writer is convinced that all of the atheistic arguments of modern civilization in their combined action have not done so much harm as the one factor of spiritual inactivity. It is Christianity's greatest single enemy. A student may

come into intimate contact with the teachings of the disbeliever in God, and yet he may be deeply enough grounded in religion to resist the arguments. But, on the other hand, no Christian can separate himself from participation in religious devotion and remain unchanged. Inactivity invariably kills; in some cases the action is more rapid than in others, but in the end the result is always the same.

It is no cause for wonder, therefore, that students frequently return home from college with reduced religious fervor. Even the mature Christian cannot keep out of touch with his church organization for a period of four or more years and retain his old time enthusiasm. Much less can young men and young women of college age hope to remain unharmed. Their careers have not as yet been definitely determined and they are quickly modified by the various factors of their immediate environment.

The comparative ease with which young people are influenced by their surroundings can be illustrated as follows: The great northern third of Siberia has recently emerged from waters of the ocean. The streams that traverse this country, especially as they approach the Arctic seas, are slow and meandering. With the coming of winter frosts, the mouths of the

streams are often obstructed by masses of ice, to such an extent that the water farther to the south is compelled to spread out over vast tracts of the adjacent, low-lying territory. When spring returns and the jams of ice disappear, the waters are again permitted to move slowly toward the ocean. But the country is so flat and the stream channels are so poorly marked that the water may or may not follow its course of the previous year. It can flow toward the east, the west, or the north with nearly equal ease. Not infrequently most trivial factors determine the directions in which the streams shall flow.

As future time passes, however, and the country continues to rise, the channels will be cut deeper and deeper until finally the streams will flow year after year, and age after age, in the same courses. The combined engineering skill of the world will then have difficulty in diverting one of these old mature streams from its deeply eroded channel. Yet in its youth scarcely more than a wagon-load of sand or a fallen tree would have accomplished the same result.

Thus it is with young men and young women. They may be devoutly religious today, with their general courses trending toward the right, but if they are left alone, other factors

will appear and steer them in undesirable directions. When individuals become well entrenched, when their channels are deeply cut, the dangers correspondingly disappear.

There is only one path of safety. College people, both men and women, should never become so fully absorbed in their scholastic work that they have no time for religious duties. They should keep well in mind that the athlete, the musician, the orator, the engineer, all succumb to the attacks of inactivity. Students commonly feel that they can run the gauntlet safely, that their faith in God will carry them over. At times they may be partially successful, provided that the period of rest is not too long, but it is not the part of wisdom to defy a law of nature before which a large percentage of offenders fall.

The spirit of man needs food, and, like the body, it will weaken and finally die without it. The only path of safety lies in assuming some regular religious responsibility. Students frequently feel that they cannot keep up their school work and simultaneously devote a part of their time to church duties. In most cases this is a mistake. Participation in religious devotion, especially on the Sabbath day, always acts as a diversion. Those who have tried it are a unit in declaring that, the year through, they

can do better work by resting on the Sabbath than by working the full seven days.

In the light of these developments, it seems wholly unnecessary to ask the question as to why attendance at college detracts from religious fervor. Rest, everywhere, is followed by deterioration and final atrophy. Work, continuous work, is the only safeguard against decline.

CHAPTER VII

THE PRINCIPLE OF EVOLUTION

Few subjects have been discussed more widely than evolution, and yet the public at large understands but very little of its real significance. To the majority of people the "man-monkey" idea and evolution are one and the same thing.

Failure to comprehend the actual import of the principle of evolution is not limited to those who are otherwise poorly informed; on the other hand, the misunderstanding is present among people of nearly every walk of life. The trouble seems to have arisen primarily because of inability to distinguish between the principle itself and some particular phenomenon that it is thought to explain. The principle of evolution is infinitely more inclusive than any single matter to which it is applied. Darwin's theory of the anthropoid origin of man, for instance, might easily be wrong without affecting the validity of the principle itself. This matter will be clarified in the following pages.

Stripped of all complexity and viewed in its simplest form, evolution is scarcely more than

the principle of cause and effect. Its operation involves at least two phenomena, that which acts and that which is acted upon. An experience of the writer while this chapter was in course of preparation will serve as an introductory illustration. While walking along an unfrequented path the writer saw protruding from beneath the thawing snow the remains of a pocket knife. It was apparent that the knife had been there for a long time, since the handle was cracked and the blades were badly rusted.

The point of chief interest is that the knife had been so fully modified by outside agencies that the materials of which it was formerly composed were scarcely recognizable. There could be no doubt that the unshapely mass was at one time a valuable knife, but its form had been so completely changed by the action of extraneous influences that its original identity had largely disappeared.

The rate at which a given material undergoes modification may vary greatly with change of environment. Dry fagots of wood when placed in a glowing bed of coals are rapidly consumed, but if they are properly protected from destructive agencies they will last almost indefinitely. On the writer's desk is a knot of wood that was recently taken from an artesian well at

a depth of more than four hundred feet. The wood was buried in the sediments of an ancient lake more than twenty-five thousand years ago, and yet its structure and its composition have remained practically unchanged. The lines of growth are still discernible and the tissue ignites easily when subjected to the flame of an ordinary match.

Certain other materials are largely immune to the influences of usual environment. Metallic gold, for instance, is practically unaffected by the attacks of air, wind, water, and even most chemical compounds. The last statement would be more accurate, however, if it implied that the affect of these agencies is exceedingly slow rather than absent, since even the most highly resisting materials are believed to be affected by every influence to which they are subjected.

So far as known, nothing in the field of nature is entirely resistant to variation. A substance might be immutable if it were placed wholly beyond the influence of other agencies, but whenever variable association is permitted, changes always follow.

The principle of cause and effect is recognized in every field of human activity. In the industries it is recognized, for instance, in the canning of fruits and vegetables. After proper

preparation, these materials are placed in cans, hermetically sealed, and subjected to temperatures sufficiently high to destroy the various microscopic organisms by which they are attacked. The purpose of the operations is plainly two-fold, first, to kill the destructive organisms, and, secondly, to place the fruit in an environment where further attack is impossible. Vegetables and fruits remain unchanged only when they are placed outside the influence of destructive agencies.

Similarly, this principle of cause and effect lies at the base of all social activities. Efforts are continuously being made to hedge young people about by an atmosphere that evil cannot penetrate. They are urged to select companions whose influence will be uplifting and otherwise to indulge in wholesome pastimes. If the principle of cause and effect were not present, there would be no necessity for throwing safeguards around young people, since they could go whereever they chose and not be influenced, either for good or for evil, by anything with which they came in contact. All this, of course, is impossible; the realm of nature is one great field of action and inter-action. The entire science of social uplift is based upon the fact that un-

wholesome conditions produce unwholesome results, and vice versa.

If immutability exists anywhere in the world's social domain, it has never been recognized. No person, possibly not even Deity Himself, can go through life unaffected and unchanged by the influence of his surroundings. On the other hand, everyone is made better or worse by the people he meets, the books he reads, and the thoughts he thinks. Human character is the product of many factors.

Even the degree of health that we possess is determined largely by the kind of influences with which we surround ourselves. Unsanitary, unhealthful conditions are never productive of wholesomeness. We refrain from subjecting ourselves to contagion because of the undesirable conditions that are likely to follow, and we live clean lives because of the benefits derived from such a course.

If this line of thought were followed into every avenue of the operations of nature, the results would be much the same. Nothing is immutable, nothing is unchangeable, nothing is wholly unaffected by extraneous environment. The law of cause and effect is as broad as the universe itself.

Everywhere in nature, the present condition

of things is the result of the operation of past influences. Things are as they are because of what they have passed through. The present is largely a sum total of all previous time. The knot of wood that now rests on the writer's desk tells the story of an ancient tree nourished by the moisture of a fertile soil. It tells the further story that after the tree had fallen to the ground, at least part of it was carried by the force of a mountain stream and deposited in the still waters of a lake, after which it was slowly buried beneath sediments that were transported by the incoming streams. Then for ages it lay beneath the protecting influence of hundreds of feet of muds, and sands, and gravels. Still later an iron pipe, driven by the intelligence of man, made it possible for this fragment of wood to come back to the surface and out into the brilliance of daylight, from which it had been hidden for thousands of years. Finally an observing friend carried this knotted evidence of ancient life to the writer's desk, where it now awaits classification preparatory to its being put on exhibition among other records of the past.

The fragment of wood as it exists today is the result of all the influence to which it has been subjected through ages gone by. It is the product of the past. If we could decipher the mi-

nutest fragments of the record, we would undoubtedly see that no influence has been too great and none too slight to have left its imprint upon the wood. The gentle rains of spring and the hoary frosts of winter left their marks on the ancient tree, as did also the periods of drought and the periods of plenty. In the great economy of nature, nothing is lost. Not even a leaf can fall to the ground and its influence be obliterated.

The writer's second son is just now completing his third year in high school. His present degree of intelligence is the result of almost innumerable factors, some of which extend backward even beyond the time of his birth. The training he received at his mother's knee, in church organizations, in the kindergarten, in the grades, from the books he has read, and from his associates; these, and many other factors, have made the youth what he is.

From the writer's window, and only a few miles distant, can be seen a lofty range of mountains that rears its majestic peaks almost beyond timber line. In the remote past the area now covered by this upland comprised a portion of a vast sea bottom, over which a variety of stream sediments was slowly scattered. Ages passed and finally the forces of nature began to lift this

almost incalculable weight from beneath the waters of the ocean. In course of time the waters drained off, and slowly, very slowly, the birth of a mountain range began. Sluggish and poorly marked streams made their way down the gently sloping surface of the rising highland. Simultaneous with the uplift, the streams cut deeper and deeper and the peaks became sharper and sharper. A great fault occurred along oneside of the range and thereby hastened the difference in elevation between the highland and the adjacent valleys. Finally the unshapely mass was fashioned into a mighty range. The mountains as the writer now sees them, with their snow-covered heights glistening in the sun, are the result of all that has gone before.

Every stream that entered the ancient ocean, nay, every grain of sand that was carried into it has had its effect. Every animal that deposited a shell, no matter how small, made its contribution. Every windstorm, every period of frost, and every particle of running water has performed its part in giving the mountain its present form. The range as it now exists is the product of the past.

By way of summary it should be noted that nothing in nature is wholly immutable. Changes are everywhere taking place. A moun-

tain range, a tree, or a blade of grass cannot continuously withstand the attacks of outside influences. Rocks disintegrate or consolidate; plant life grows or decays; mountains become higher or lower; human beings become better or worse. Nothing is unchangeable; immutability does not exist.

Even religion, the choicest thing in the world, consists of a systematic series of efforts designed to place its adherents outside the field of wrong-doing and within the field of right. By continuous activity along certain lines it is believed that individuals will eventually become immune to the influences of evil, and that finally they will respond only to that which is noble and true. Then, even in matters of religion, unchangeability does not exist, otherwise eternal betterment would be impossible. Religion selects the direction in which change is desirable, while vice selects the opposite.

This all-pervading principle of cause and effect is the ground work of evolution. The essence of evolution is the essence of continuous change. Wherever continuous mutability occurs evolution is present, and wherever mutability is absent development cannot exist. In its simplest form, therefore, evolution is essentially a series of changes brought about by the laws of nature.

The term evolution can be used with equal propriety in connection with the development of a mountain range, a human being, or a blade of grass.

In a slightly more technical sense the term evolution means "to roll out of" or "to unroll like a scroll", and, therefore, it consists of the sequential stages through which the thing has passed. While evolution is commonly thought of as being progressive, variations may take place in either direction, progressive or retrogressive.

From the foregoing discussion it is clear that the principle of evolution has a wide field of application. Anything, either in the organic or the inorganic world, that has passed through an orderly sequence of events ante-dating its present condition constitutes its evolutionary development.

The only things that do not evolve are those that are unchangeable, and the only things that are unchangeable are those that are unaffected by the influences to which they are subjected. Inasmuch as nothing in nature is wholly resistant to the influences of its environment, it appears that everything in the universe has passed through a series of systematic changes, and,

therefore, that everything in the world is the result of evolutionary development.

It should be clear by now that evolution is not equivalent to the "man-monkey" idea. Evolution is a principle of world-wide existence: it is infinitely bigger than any particular application of it. Although Darwin employed the principle of evolution in his theory of the descent of man, yet this use is only one of an almost infinite number that is being made. The principle of evolution—the principle of systematic continuous change—is now applied to the inorganic world as well as the organic. It is used in geology, in astronomy, in psychology, in sociology, in biology, in economics, in history, in anthropology, and in everything that possesses a past history of systematic changes.

Sharp distinction should be drawn, however, between the principle itself and any particular application made of it. The validity of the principle cannot be affected by the outcome of any effort designed to explain the manner in which it operates, since the principle is true and the application may be wrong. The American Indians, for instance, are undoubtedly the descendents of a long line of progenitors, yet ethnologists have failed to explain their particu-

lar line of descent. The failure, however, does not destroy the fact that the present condition of the Indian is the result of a long series of past experiences.

CHAPTER VIII

PRESENT STATUS OF ORGANIC EVOLUTION

In a previous chapter it has been shown that the principle of evolution applies to all systematic variations, whether they relate to history, to economics, to science, or to any other branch of developmental progress. The principle is employed by the historian in his study of the origin of civilizations, of nations, and of communities; by the economist in the origin of commerce, of banking, and of public utilities; by the scientist in the origin of life, of the universe, and of the earth; and by other investigations in the origin of almost countless phenomena.

Organic evolution is the branch of evolution that deals with the development of plant and animal life. According to its teachings all plants and animals have come up through a long line of successive changes from a common ancestry. The doctrine teaches that both animals and plants sprang from the same stock, and, therefore, that they are genetically related. The purposes of the present chapter will be served,

however, if the term organic evolution, as subsequently used, is regarded as equivalent to the development of animal life alone.

The doctrine explains that the animal kingdom, past and present, is comparable to a highly developed tree. The trunk is the original *amoeba*, or something similar to it. The principal branches, with their repeated bifurcations, are the larger groups of life, while the twigs represent the various smaller subdivisions such as genera and species. The major branches appeared far back in geological times. Some of these have persisted on through to the present; others have long since disappeared. The branches that terminate at lower geological levels represent the various forms of extinct life and those that reach up to the level of today represent all life now extant upon the earth. Adherents of the doctrine explain that even though many of the modern animal forms are not strikingly similar to one another, yet if they could be traced back into distant geological time, they would be seen to become more and more alike and finally to merge into a common ancestry.

The doctrine of organic evolution includes also the origin of man. It teaches that the lineage of modern human beings leads back

through various aboriginal progenitors and finally to a common inheritance with certain forms of the anthropoid apes. The doctrine teaches that although original man probably differed but slightly from his nearest animal relatives, yet he later assumed increasingly modern aspects and finally developed into his present form. During the course of this development the human race is believed to have divided and subdivided a number of times. Most of the branches, however, have since become extinct.

Although the doctrine of organic evolution had been taught among the Greeks and had later been outlined in much detail by Buffon and by Lamarck, yet to Charles Darwin was left the task of convincing the world of its truthfulness. This he undertook to do in his memorable work, the *Origin of Species,* and later in his *Descent of Man.* At first, Darwin stood practically alone but gradually his masterly arguments won him fresh recruits and within a few years practically the entire scientific world had accepted the doctrine that he was championing. Aside from preparing an almost unlimited array of evidence in favor of the doctrine of organic evolution, Darwin also presented his ingenious theory of natural selection.

The arguments that Darwin and his asso-

ciates advanced to support the doctrine of organic evolution were drawn primarily from the following sources: variation, comparative anatomy, geographical distribution, embryology, and experimentation. At the time Darwin published his *Origin of Species* paleontology had not been established as a definite science. Moreover, Darwin died not knowing just what evidence the geological record would bring forth.

In the immediately following paragraphs brief mention is made of the principal sources from which evidence is obtained in support of the doctrine of organic evolution. No apology for extreme brevity is necessary in an article of the present kind.

Animals and plants never give rise to offspring exactly like themselves; in fact, even the individuals comprising the offspring differ from one another. This variation is interpreted to mean that life never breeds absolutely true to form; in other words, that immutability in nature is unknown. Moreover, if the variations, no matter how slight, could be accumulated over long periods of time, the end-forms would be proportionately different from their remote ancestors. The tendency to depart from absolutely fixed standards seems to be proved by the universality of variation.

Studies in comparative anatomy have shown that various forms of animal life are constructed upon essentially the same fundamental principles. This is particularly evident in closely related forms, such as, say, dogs and wolves, and may be plainly seen in other forms as distantly related as men and horses. For example, the number of bones, their placement, and their structure are similar in the various groups. This is also true of the digestive system, the muscular system, the respiratory system, and the circulatory system. Briefly, the various organs present in one kind of animal life have their counterparts in other groups, even though somewhat distantly related. This similarity of function and of structure is interpreted to signify that the various forms of animal life have sprung from a common parentage.

A cursory examination of the present geographical distribution of animal life seems to warrant the conclusion that the various forms are hopelessly intermixed, except perhaps that they are arranged in climatic groups, such, for instance, as polar bears, white foxes, and eskimos in the arctics, and lions, monkeys, and negroes in the tropics. A closer scrutiny, however, reveals the fact that the same forms of life are not always present in regions of similar climates.

This is illustrated in the case of Australia, Africa, and South America where the climates are much alike but where the animal life is vastly different. Still closer examination shows that the animal life may be grouped into even smaller geographical units, each easily distinguishable from its neighbors. By means of his knowledge of the past geography of the earth, the geologist is able in most cases to understand this apparently meaningless confusion. Not all of the problems have been solved, yet in all cases where the work is completed, the present geographic distribution is found to be the result of evolutionary development from a common parentage, influenced by past geographical disturbances.

The embryologist has discovered that many of the forms of animal life pass through similar stages of development immediately following fertilization. In fact the similarity is so close during early embryonic stages that even in forms as distantly related as, say, men and sheep the difference can be detected only by the specialist. Inasmuch as embryonic development is believed to be a recapitulation of the stages through which life forms have previously passed, the marked embryonic similarity is accepted as an evidence of genetic relationship.

Experimentation has provided almost unlimited evidence that shows the ability of nature to produce new forms. Most of the domestic plants and animals have been developed from parents more or less unlike themselves. This is true of roses, grapes, apples, dogs, horses, cattle, and numerous other familiar types. The experimenter has usually secured his results by means of cross-breeding favorable variations or by means of isolating them. The experimenter admits his present inability to produce perfectly stable forms and, furthermore, he admits that all of his variations would likely become extinct or revert to the parent stock if the special environment were removed. He argues, however, that inasmuch as evolutionary development is known to proceed very slowly, experimentation should not be expected to produce in a few years what nature does in almost infinitely longer periods. The ability of nature to produce new forms under a specially provided environment is regarded as evidence of her ability to accomplish the same thing whenever proper conditions arise.

Since the days of Darwin, geology has produced an almost infinite array of evidence in favor of the doctrine of organic evolution. The geological record begins with primitive types of life and continues on to the present with forms

of almost continuously increasing complexity. The fondest hopes of the evolutionist could scarcely have been more completely fulfilled.

Certain over-zealous persons, however, frequently make the statement that the geological record traces animal life back to unicellular ancestors. This, of course, is a misstatement of fact. The most primitive forms discovered in the geological column are those of the Cambrian and the Proterozoic, all of which are exceedingly complicated in comparison with unicellular types. Moreover, it will be recalled that these organisms represent all of the major subdivisions of the animal kingdom with the exception of the vertebrates.

Since the time of Darwin the doctrine of organic evolution has grown in almost continuous favor. The total evidence derived from all sources has thoroughly convinced the scientific world of the truthfulness of the doctrine. At the present time, sixty years after Darwin, the theory of organic evolution is accepted more widely than ever before. By many scientists it is no longer regarded as a theory but rather as an established fact, on much the same basis as Newton's law of gravitation.

Those who are not familiar with the doctrine of organic evolution sometimes feel that

they have successfully answered its claims by stating that no one ever heard of an animal giving rise to offspring different from its own kind, say, a dog giving rise to a wolf. Such a statement, of course, scarcely merits serious consideration, since no form of the doctrine contemplates the likelihood of a change of this character. Aside from its suddenness, the change is impossible because neither of these forms could give rise to the other, irrespective of the time involved. On the other hand, the doctrine teaches that back in geological time the dog and wolf gradually arose from a common ancestor and that at present the two forms are comparable to the distal twigs of a bifurcating limb, neither of which arose from the other, but both from the same branch.

Moreover, the fact that scientists do not agree as to the manner in which evolution operates, is often interpreted to mean that they disagree in the matter of the validity of the principle itself. This, of course, is all wrong. The fact that a thing has undergone various changes in its past history is not equivalent to an explanation of the causes that produced these changes.

Inability to explain a condition does not, of course, destroy the validity of the condition it-

self, otherwise civilization would be compelled to abandon the greater part of its choicest beliefs.

A great many efforts have been made to ascertain the manner in which evolution takes place, but as yet only partial success has been attained. Many theories have been proposed and many truths have been discovered, but the fundamental reasons for the operation of evolution still remain unknown. Following is a brief summary of the principal theories that have been advanced to explain the causes of evolution. Each of them contains much truth, but even in their combined form they are not regarded as an adequate explanation.

The earliest noteworthy effort designed to explain the manner in which evolution takes place was that of Lamarck. In 1809 he advanced the theory that certain characters acquired during the lifetime of the individual are passed on to succeeding generations and thus become effective in directing the line of evolutionary development. It is well known, for example, that various muscular organs become stronger through use and weaker through disuse, particularly during the early lifetime of the individual. The arm of the blacksmith develops while that of the bookkeeper weakens. According to Lamarckism, the various peculiarities acquired by the

parent reappear in the offspring, and thus by continued effort along similar lines, succeeding generations gradually evolve in a given direction. In harmony with this explanation the children of blacksmiths should be born with slightly stronger arms than should the children of bookkeepers. The intellectual and muscular activity, both positive and negative, of all animal life is similarly believed to be impressed upon succeeding generations. At present, however, the transmission of acquired characters, as explained by Lamarck, is not viewed with favor by most scientists. In consequence of this feature and other objectionable ones, Lamarckism, in its entirety, has but few supporters.

It should be noted, however, that scientists are somewhat generally coming to believe that certain acquired characters are inherited by the offspring and, therefore, that Lamarckism contains more truth than was formerly supposed.

Standing pre-eminent among the various efforts attempting to explain the causes of evolutionary development is Darwin's theory of *natural selection*. This doctrine is essentially an explanation of the preservation of favorable qualities by means of competition with less favorable ones. According to its teachings, the struggle for existence eliminates the less favored

individuals and permits the more favored ones to live on and therefore to become the progenitors of the next succeeding generation. By this means the continued accumulation of certain qualities results in the appearance of life forms more or less distinct from their ancestors. The doctrine implies the inheritance of acquired characters, and, therefore, on this ground alone, it is regarded with suspicion by certain investigators. The further fact that it does not attempt to explain the *origin* of variations, but simply their preservation after they have appeared, has made it inacceptable as an exclusive explanation of the evolution of animal life.

Paleontologists have discovered what appears to be indubitable evidence that at least some forms of animal life have developed along well defined lines. It will be remembered that according to the doctrine of natural selection variation should take place in all directions, but the geological record seems to have proved that such is not always the case. On the other hand, various forms of life are now known to have advanced along definitely limited directions, almost as if their lines of descent had been predetermined. Efforts that are designed to explain the evolution of life by means of the principle of directed descent comprise the doctrine of

orthogenesis. While scientists somewhat generally admit the existence of such a principle in nature, yet no one regards it as a complete explanation of the evolution of animal life.

The theory of *mutation* holds that the evolution of life does not take place by minute transitions but rather by quick, sudden changes; the line of descent is, therefore, characterized by distinct breaks. Advocates of the theory point to the fact that by means of experimentation certain forms of life, specifically primroses, have been produced that are remarkably different from their immediate ancestors. Experimenters generally, however, insist that new forms are produced by utilizing minute changes rather than sporadic, sudden ones. It should be observed that the mutational theory does not explain the *origin* of changes; its chief point is that the changes are sudden rather than gradual. Although the theory has some staunch supporters yet it has never been widely accepted as a sufficient explanation of evolution.

During the last fifty years, waves of faith have passed over the scientific world, first in one theory and then in another. The explanations of Lamarck, Darwin, Eimer, Haeckel, Weismann, DeVries, and others have each received favorable attention, and then, in most

cases, each has been discarded. Frankly, therefore, none of the explanations has proved to be wholly satisfactory. Each has its merits within restricted fields of operation, but none offers an adequate answer to the question.

This temporary failure does not mean that the tremendous effort has been lost. Theories are really scaffolds that are torn down after the structure of knowledge has been completed. By means of these investigations science has approached much closer to the final solution of the problem. Other discoveries will doubtless be made and finally a complete answer will be given. Just what lines of investigation will be followed in the future is difficult to state, but the scientist has already returned to the task and will not weary in his efforts until final success has been attained.

Failure to explain the causes of evolution does not, of course, affect the validity of the principle itself. The doctrine of organic evolution is at present more widely accepted than ever before.

CHAPTER IX

DARWINISM

In a popular sense the term *Darwinism* is now widely used as synonymous to the term evolution. This confusion has doubtless arisen from the fact that Charles Darwin, the great English scientist, has done more than anyone else to convince the world of the truthfulness of the doctrine of evolution. While the theory of evolution had been in existence for hundreds of years before Darwin's time, even from the days of ancient Greece, yet it was Darwin who brought it prominently before the world and gave it a genuine scientific standing. It should be borne in mind, however, that Darwin was not the author of the evolutionary doctrine; his principal contribution purports to be nothing more than an explanation of *how* development takes place. It is not the purpose of Darwinism to prove that the doctrine of evolution is true, rather to show the *means by which it operates.*

Just at present there are very good reasons why the reader should have clearly in mind the differences between the terms Darwinism and evolution, that is, between Darwin's contribu-

tion and the doctrine itself. Of recent years Darwinism has undergone severe criticism, and, by some scientists, almost complete rejection; the theory of evolution, on the other hand, is more widely accepted today than ever before. It is apparent, therefore, that the distinctive features should be kept clearly in mind. Lack of differentiation may be the cause of much confusion. Otherwise, when it is announced, for instance, that some prominent scientist is opposed to Darwinism, the erroneous interpretation will probably be made that he is opposed to the theory of evolution itself.

The doctrine of organic evolution made its appearance in Greek philosophy as far back as six hundred years before Christ. Most of the ideas that these ancients advanced, however, were largely speculative, and little or no effort was made to support them by systematic data. The theory reappeared again and again throughout succeeding centuries, but it was not given definite form until about the beginning of the nineteenth century, at which time the French scientist, Lamarck, outlined it in almost its present exactness. Lamarck would probably have become the founder of our modern conceptions of evolution had it not been for the unmerciful criticism which came from his powerful and

dogmatic contemporary, Cuvier, who simply laughed the "follies" of Lamarck out of court, in consequence of which Lamarck's views received but little serious attention and were soon lost sight of.

Perhaps the strongest single factor preparing the way for the present conception of evolution was Sir Charles Lyell's epoch-making work, *Principles of Geology*. Previous to Lyell's time the interpretation of the earth's history was under sway of Cuvier's theory of "catastrophism", according to which the tranquil operations of nature were frequently interrupted by revolutions of indescribable intensity. Old conditions were quickly swept aside and were suddenly replaced by new ones. Accordingly, the earth's history was made up of long periods of quiescence, interrupted by violent cataclysms, during which the continents were transformed and all living things were destroyed. Successive periods of tranquility were marked by the appearance of more and more advanced forms of life.

To the doctrine of catastrophism Sir Charles Lyell was unalterably opposed. He believed with the Scotchman, James Hutton, that the key to the history of the earth's past is to be found in the agencies that are now operating upon it;

in other words, that to understand the past we must study the present. Lyell believed that the mountains, the plains, and all physical phenomena were developed through the operation of agencies similar to those that now exist. To him the history of the earth is a long series of events slowly and gradually modified by the same type of factors that are producing present-day changes.

Lyell's orderly conception of earth history was thus in bold contrast to the catastrophism of Cuvier. Fortunately, Lyell's views secured a favorable hearing in England. His famous *Principles of Geology* ran through edition after edition, following its appearance in the early part of last century. Strangely, however, he was not at the time a staunch advocate of the doctrine of evolution as applied to animals and plants, although it constituted the soul of his work as applied to the physical development of the earth.

In 1831 when Charles Darwin left for his famous trip around the world in the British ship, *Beagle,* a friend presented him with a copy of Lyell's work on geology. During the long voyage that followed Darwin had abundant time in which to familiarize himself with the findings of the great scientist. Probably no

other work influenced Darwin anything like as much as did this one of Lyell; in fact, it has been said that Darwin's later work was largely an application of Lyell's geological principles to the world of living things.

By the time the expedition had reached the shores of South America, which was one of the first countries to be studied, Darwin was pretty well saturated with Lyell's idea that the present is the result of orderly development from the past. He turned his attention at first to geology, but he was soon attracted to the wonderfully varied and abundant life of the Brazilian tropics. A little later while exploring the pampas beyond the present site of Buenos Ayres, he discovered the fossil remains of giant mammals that had long been extinct. It was probably at this time that he was first impressed with the likelihood that these animals were the ancestors of somewhat similar ones now living.

The *Beagle's* voyage continued slowly southward, around the Horn, up the west coast as far as Peru, and then westerly across the Pacific. Numerous stops were made at points in the Pacific ocean, and finally the company rounded Good Hope, touched once more on the Brazilian coast, and returned to England in 1836, after having been absent five years.

The trip had transformed Darwin from a somewhat careless youth into a careful, systematic scientist. One of his obligations to the British government was to write a report of the *Beagle's* expedition, which today is regarded as one of the world's classics in travel. A little later he published an account of his studies in the coral reefs of the Pacific which won him instant favor among geologists. Still later his report on barnacles gave him prominent standing in the zoological world.

In the meantime he had been continually working on the question of the origin of living forms. The abundant material collected on the voyage had already convinced him that animals are not immutable and he was slowly coming to believe that the animals of the present are the descendants of those that lived in the past, but of the manner in which the change was brought about he seemed to be uncertain.

He was attracted by the fact that gardners are able to develop new varieties of plants that differ materially from the parent stock. He also turned his attention to a study of the methods by which stock breeders produce their changes.

Finally in 1838 he came across a book entitled *An Essay on Population,* in which the

author, Malthus, calls attention to the prolific manner in which plants and animals multiply, and, furthermore, that the number of individuals from year to year remains practically constant. This idea impressed Darwin greatly, since it seemed to offer a key to the solution of many of the problems confronting him.

He himself observed that although the number of toads, and snakes, and birds, and flowers varies slightly from year to year, yet over a considerable period of time the number remains nearly constant. On the other hand, both animals and plants produce far more than a sufficient number of offspring to replace the disappearing parents. What becomes of the excessive number and why do they disappear? Darwin felt that the answer to this question would provide a solution for even bigger problems.

Darwin next turned his attention to the means employed by the skillful gardener in developing new forms of plant life. He observed that after the young plants had come into bloom, the gardener carefully selected some particular variety that he wished to preserve; at the same time he discarded or destroyed all the undesirable ones. The selected seeds were planted and again the desirable ones were preserved. The process was repeated year after year, usually for

several seasons, and finally a type was derived that bred true.

Darwin intuitively observed that nature is bringing about the same sort of selection. Most of the common weeds, for example, are producing sufficient seed, if all of them were to develop into mature plants, completely to cover the earth from pole to pole in the course of half a dozen generations. This, of course, is not possible of accomplishment. Some of the seeds are too weak to germinate; others spring up only to be choked out among the masses of similar plants; others fail to mature because of deficiency in the flowering apparatus; others are eaten by animals perhaps because of the improper development of some protective device. Only a few of the vast number are permitted to go on to maturity, and these survive primarily because they are better prepared to do so than are those that fail.

Darwin was convinced that this process of natural selection is an answer to the conundrum of progressive development—of evolution. He concluded that the selection, generation after generation, of the best types of individuals would gradually lead to the development of offspring superior to their ancestors, since nature

would thus preserve desirable qualities and destroy the undesirable ones.

The case of the red-breasted robin will serve to illustrate the manner in which the principle of natural selection is supposed to operate. A pair of these birds will produce annually an average of two nests of four young birds each, which with the parents make a total of ten at the close of the season. If these ten birds live through the coming winter and each of the five pairs produce eight young birds, there will be fifty at the close of the second season. If this should continue for a period of ten years there would be more than twenty million robins as direct descendants of the original pair.

This condition is, of course, impossible. Inasmuch as about the same number of robins lives over each year, the death rate must be exceedingly high. To be specific, it may be assumed that eight out of every ten robins die each year, a number equivalent to eight hundred out of every thousand. This tremendous destruction of life, moreover, is the result of the normal operation of law. Robins are not all hatched with equal qualifications. Some are frail and weakly; others are robust and strong. Some are brilliantly colored and attractive; others are dull and unattractive. Nature

has given to some of them a thick coat of feathers and strong wings and to others scanty feathers and improperly developed wings. Thus, from the beginning they are unequally matched in the conflict of life.

Nature is a severe taskmaster. She shows no favoritism to the weak and she extends no mercy to those in despair. Whosoever comes under the influence of her unswerving law must suffer the consequences. Each season as the great horde of birds goes forth nature has already decreed that the greater part of them must perish. The prospect is far from encouraging.

The competition for existence quickly thins the ranks of the red-breasted songsters, especially during the winter months. It is not difficult to foretell which of the birds will perish first, and which ones have the better chance of living through to spring. Day by day the undernourished birds disappear. This under-nourishment is usually due to a number of factors, including chiefly scanty feathers, wings poorly adapted to long flight, lack of aggressive disposition, and even unattractive coloring. Moreover, the birds that are best fitted to survive do not escape the rigors of winter. Their shrunken and emaciated bodies bear mute evidence of the serious-

ness of the conflict through which they have passed. From this point of view, the surviving robin seems to be justified in practically bursting its throat with song at the first approach of spring.

The destroying hand, however, does not limit its reaping to the winter months. Competition is always present. The robin is not only required to compete for food, but it must continuously guard against the attacks of other birds and animals. There is scarcely an instant during its waking hours when it is not under the necessity of being prepared to resist or to avoid the attacks of its competitors.

It appears reasonable, therefore, that a large percentage of robins should fall prey to this continuous and gruelling warfare, and, furthermore, that the better ones should survive. Moreover, those that are preserved should give rise to slightly superior descendants. Again the superior ones will be preserved, and again the stock will be improved. Gradually the poorer ones will be eliminated and the better ones retained. In course of long periods of time this selective action is thought to result in the development of individuals highly different from their ancient ancestors.

This explanation at least is Darwin's great-

est contribution to the doctrine of evolution. Darwin chose to call it *Natural Selection,* and at a later time Spencer proposed the significant expression, *Survival of the Fittest.* Darwinism is simply an effort to explain the manner in which nature preserves the better individuals and eliminates the poorer ones. Darwinism is not equivalent to evolution; the former is nothing more than a purported explanation of how the latter operates.

In its relation to Darwinism the doctrine of evolution might be likened to some great phenomenon, such, for instance, as an ever-recurring wind, the influence of which can be seen in the deforming of trees and the drifting of sands. Speculation as to the *cause* of the wind and the manner of its movements would likely lead to various conclusions. Some one might argue that the wind is due to clouds and to nearness of certain mountains, another that the moon is the determining factor, and still another that it is governed largely by differential temperatures in the atmosphere. Whether or not any or all of these suggestions has or have a proper bearing does not affect the fact that the wind exists.

Darwinism is an effort to explain the operations of an almost universally recognized phe-

nomenon. Darwinism could be entirely wrong and yet the thing that it attempts to explain could be wholly right. To go back to the illustration: The wind would still exist in spite of the fact that all of the theories of its origin were wrong. Similarly, Darwinism could be abandoned completely without affecting the validity of the doctrine of evolution.

No statement of the doctrine of natural selection would be complete without mentioning the fact that Alfred Russell Wallace independently developed almost identically the same explanation. He had arrived at the conclusion while studying the animal and plant life of the Malay Archipelago, and through the strangest sort of coincidence he sent his manuscript to Darwin for criticism at almost precisely the time that Darwin had his own ready for publication. Darwin, of course, was amazed to note that Wallace had reached a similar conclusion, and he at once decided to publish Wallace's manuscript and to withhold his own. Through the influence of friends, however, both papers were presented at the same meeting of the Linnaean Society, and both papers were accorded a hearty, but very critical reception.

Everyone is familiar with the storm of protest that the appearance of Darwin's *Origin of*

Species brought forth. No other book in the world has been met by such vigorous and determined opposition. It was attacked alike by both scientists and churchmen. People in general had not been seriously averse to believing that continuous development had taken place in the geological world as explained by Lyell in his *Principles,* but when the cold blooded process of natural selection was applied to plants and animals, and especially to human beings, it was regarded as almost blasphemous.

In conclusion it should be noted that the life work of Darwin consisted of two parts. A large number of philosophers and scientists before him had tried with varying degrees of earnestness to convince the world of the existence of an evolutionary development, but each had failed. Darwin turned himself to this task, but unlike most of his predecessors, he presented an almost infinite number of carefully prepared details. He seemed to be able to anticipate every argument that would be raised, so that when his work finally appeared practically every objection had already been answered.

The other part of Darwin's work—his personal contribution to science—is the doctrine of *Natural Selection.* This is Darwinism.

As the storm of opposition went on, scien-

tists one by one began to take their stand by Darwin. Huxley in England, and Haeckel in Germany, were among the foremost advocates of the Darwinian idea. Gradually the greater part of the scientific world became converted, but before the tempest had fully passed, word came that Darwin's heart, which so long had been the cause of his much suffering, had beaten its last, April 19, 1882. It can be said to the great honor of the church, which so long had regarded him as its enemy, that permission was given to have his body buried in the Abbey at Westminster, where it now rests prominently among the vast throng of illustrious dead.

CHAPTER X

PRESENT STATUS OF DARWINISM

Darwin's chief contribution to the problem of organic evolution is the doctrine of natural selection, properly called Darwinism, and which is based on the following fundamental facts: first, in the case of both animals and plants, nature produces far more than sufficient offspring to replace the disappearing parents; secondly, the number of adult individuals comprising any particular group remains practically the same from year to year; thirdly, scarcely no two organisms in nature possess identically the same qualifications with which to battle in the struggle for existence; fourthly, generally speaking the individuals that are better fitted to live are the ones that nature preserves.

Darwin thought that he recognized in these principles an explanation of the manner in which nature brings about continuous development. He argued that if natural selection were to go on for long periods of time it would lead to the development of groups vastly different from their ancient ancestors. Moreover, the extremes to

which variation could go would be governed largely by the length of time over which it operated. The almost unlimited varieties of living forms now upon the earth are supposed to have been developed through the continuous selection of types especially fitted to survive. This at least is Darwin's conclusion.

Following the publication of Darwin's *Origin of Species,* and after the heat of the first great battle had passed, the scientific world settled down rather generally to the belief that Darwin had satisfactorily solved the problem as to how nature brings about continuous development. The explanation was so simple and the conclusion seemed to be so logical that most scientists wondered why the truth had not been seen before. Here and there within the scientific world, however, were a few individuals who from the start had insisted that the doctrine of natural selection is illogical and that it will not bear the scrutiny of scientific investigation. From these few who originally opposed the selection idea, the number has almost continuously increased, until today there are but few scientists of prominent standing who regard the doctrine as an adequate explanation of the operating principle of evolution.

The reasons for this reversal of opinion are,

of course, highly diversified. Only a very brief outline of their principle aspects can be presented here.

Those who object to the sufficiency of natural selection have made no effort to deny the fact that the number of individual organisms remains about the same from year to year or that almost infinitely more offspring are produced than can possibly survive. Neither have they denied the existence of variation; in fact, this condition is apparent to anyone who cares to observe. No two leaves, no two blades of grass, are alike. In the animal world the same disparity is everywhere present. Even among the great host of human beings, no two individuals possess identically the same characteristics. Throughout nature striking dissimilarity is present.

Darwin's application of the principle of selection, however, has been widely assailed. That nature could select these slight variations and, through preserving them for generation after generation, finally give rise to new species is not regarded by the critics as possible. The crucial objection is that natural selection *cannot select and preserve* these variations long enough to produce new species. On the contrary, as one prominent scientist expresses himself, selection

simply annihilates the extreme variations, and, instead of acting as an "instrument for the evolution of species, it guarantees their fixity". All of which simply means that natural selection cannot pick out some favorable character and produce a new type from it; on the other hand, by means of destroying the radical variations, both good and bad, it preserves the standard grade.

Believers in Darwinism have not surrendered without a conflict. The papers published both for and against the doctrine would form many large volumes. Whether the attacks have been successful can best be judged by the fact that practically all of the foremost scientists have deserted it as a sufficient explanation of the manner in which evolution is brought about. The objectors represent every line of scientific thought; they are botanists, zoologists, paleontologists, anatomists, physiologists, and embryologists. For nearly fifty years these men, most of whom are professors in the world's greatest universities, have been testing the doctrine of natural selection in their laboratory work and field work, and they have now come to the conclusion that it is unable to accomplish the task claimed for it. The fact that such an overwhelming majority of scientists is opposed to

natural selection as a sufficient explanation of evolution is probably one of the strongest arguments that can be raised against it.

Natural selection, in its most favorable aspects, does not *develop* new variations; it simply *directs them after they have been created.* To illustrate, consider the case of a young robin that possesses an especially strong and horny beak. The selection principle had nothing to do with the *origin* of this peculiar organ; it could do no more than preserve it or destroy it after it had come into existence. Something occurred before the robin was hatched that made this variation possible. Just what this something is science has not yet discovered; natural selection, of course, had nothing to do with it. In the nature of things, variations cannot be preserved or destroyed until after they have come into existence. Darwinism, therefore, is not a creative principle; it is simply a directing one.

The absence of creative ability in natural selection is a fundamental weakness. Incautious admirers of the Darwinian idea have been prone to claim that the doctrine explains every factor pertaining to the development of life; as a matter of fact, natural selection is wholly incapable on the most vital point—*the origin of variations.* The doctrine provides no adequate explanation

of the cause of new characters or of the way in which they are produced; it simply attempts to explain the manner in which they are *preserved*.

Even if the selection aspect of Darwinism were true, the theory would be deplorably lacking because of this basic deficiency. Any acceptable explanation of evolutionary development must, above all else, make clear the cause of variations or at least the manner in which they are brought about. (We of course are not speaking of final causes.) In this respect Darwin's origin of species, as explained by natural selection, is a failure at the outset, because *selection does not give rise to origins;* it simply preserves them after they have appeared.

Darwinism has been vigorously assailed by biologists also, because of its acceptance of the transmission of acquired characters. Paleontologists, on the other hand, have not regarded the inclusion of this particular doctrine as necessarily detrimental. Biologists on the whole maintain that acquired characters are impossible of transmission, while many paleontologists are confident that the geological record furnishes indubitable evidence that such has been done, at least in certain cases.

Natural selection is fundamentally a principle of development by chance. According to

its teachings, characters of the most fortuitous sort are selected and preserved because of some particularly adaptive feature that they possess. Direction of development is determined by selection. In other words, in its ultimate application, if the doctrine of natural selection were true, the world in all its complexity would appear to be the result of the chance operation of law.

It is important that this matter be made clear. It has already been shown that selection does not originate new characters; this is accomplished before selection can operate. Let it be supposed that some new character arises along a definite direction, say, in the case of birds toward whiteness of plumage. Under practically all geographical conditions these individuals would suffer rather than benefit by the change. Virtually the only places within which whiteness is desirable are the polar regions. Elsewhere birds with this particular variation would be destroyed, and others, not similarly directed, would be preserved. Thus selection is the master of variation and also of direction. Irrespective of the kind of variation upon which it has to work, whether directed or otherwise, natural selection points out in most dogmatic fashion the direction along which all development shall take

place. Darwinism does not provide for development along any definite direction. All animal and plant life as it now exists, according to this doctrine, is the result of chance operation of law. Nothing is predetermined; nothing is definitely directed.

The chance operation of law does not, of course, mean that law and order are absent, or that development is discontinuous or fragmentary. In its fundamental aspect it means that there is no directing power or energy behind nature that determines the direction in which it shall go. It is like a ship at sea under full sail, without orders and no port in view. In the main it will drift in the general direction of the wind, but is has no definite course and no specific goal. It responds to the impulses of law about it, but it drifts with the tide.

It is interesting to note that Darwin outlined his theory of natural selection before the birth of modern paleontology. He expressed belief, however, that the geological record, when properly worked out, would afford ample evidence of the theory of evolution, and probably of his selection principle. Darwin died, however, without knowing whether paleontology approved or disapproved of what he had done.

In its support of the principle of evolution,

paleontology has more than supplied Darwin's highest hopes, but in the matter of natural selection the result is different. In other words, the geological record supports the evolutionary theory, but it negates the sufficiency of Darwin's doctrine of natural selection.

It has already been pointed out that Darwinism is essentially a doctrine of chance. Researches in earth history, on the other hand, appear to prove conclusively that development has taken place along well directed lines. It is doubtful that paleontology has discovered a single instance in which development was the result of fortuity, or chance. Facts, such as these, constitute a serious blow to the claims of natural selection.

The paleontologist is especially well prepared to act as judge of the manner in which development has been brought about. His study of the history of life on the earth enables him to view the changes over very long periods of time. Almost with a single sweep of an eye he can witness the progress that has taken place through thousands upon thousands of years. The paleontologist can gather together in his laboratory or museum the fossil remains of a series of individuals, the end members of which may have lived millions of years apart, and from these

remains he can witness the various steps through which development has taken place.

The family history of the horse, as worked out by vertebrate paleontologists, affords a good illustration of the opportunity provided by this kind of work. The group begins with a tiny four-toed creature scarcely more than twelve inches high and terminates with the modern one-toed horse. Between these two extremes the paleontologist has discovered practically every conceivable gradation, and everywhere throughout this almost interminable record the presence of definitely directed development is apparent. The verdict of paleontology is that not a single case of chance development has been found. So far as known, fortuity is absent from the history of all animal life.

Paleontology has also shown that certain variations are definite and determinative from the time of their first appearance, and that they often proceed on through to development even in spite of their initial lack of usefulness. This, of course, is just the reverse of Darwin's non-directed variations. Teeth and horns in animals, for instance, show definite direction of development long before they become useful. Primitive teeth develop before they emerge from the gums and, therefore, they cannot be the

result of the principle of selection. Furthermore, among separate groups of ancient horses and other animals, the teeth sometimes independently developed along similar definite lines, even though the animals that possessed them did not live in the same habitat.

Paleontology has further shown that Darwin's principle of selection not only fails to explain the origin of variations but in many cases that it also fails to direct them. Both of these conditions are well illustrated in the case of certain *spinose gastropods*. In the early stages of the phyletic series of these creatures, the spines made their appearance in the form of small protuberances or knobs. Evidently the principle of selection could not have given rise to these structures, since selection can utilize variations only after they have appeared. Later in the development of the phylum the spines increased in length and finally they grew so long that they actually hindered the movements of these animals. Still later the spines became so cumbersome that the creatures were extinguished. Evidently the selection principle failed to function in this case, otherwise the creatures that possessed long spines would have been eliminated as soon as the spines became undesirable. The life history of such groups shows the presence in nature of

some impelling force that not only originates variations but also carries them forward, sometimes even in spite of their usefulness.

The paleontological record, therefore, seems to have definitely established the fact that the development of life on the earth is not the result of chance, but rather of exact law. The causative factors behind these laws are as yet unknown, in fact, the laws themselves are very imperfectly understood. Even their existence is known primarily because of the influence that they exert in directing the development of life.

Darwinism as a sufficient explanation to account for the evolution of life has, therefore, not made good. In the first place, natural selection cannot originate new variations, and, in the second place, it cannot preserve variations long enough to give rise to new species. Moreover, its postulation of non-directed development is out of harmony with the findings of paleontology. Unquestionably the principle of natural selection plays an important part in the development of life, but as a genetic and exclusive factor the theory has signally failed.

The fall of Darwinism from its former position of supposed sufficiency to one of subsidiary importance has brought no little satisfaction to certain theists. Darwin's non-directed method of

creation has been a source of much annoyance to many of those who believe that Deity is directing the destinies of the universe. The operation of fortuity, or chance, in nature is easily susceptible of the interpretation that nature is capable of governing itself, and, therefore, that a Divine Ruler is not necessary. If there were no governing law in the universe except the law of chance, there might be some difficulty in understanding how Deity can be in control.

On the other hand, the presence of determining law in nature is regarded by the theist as evidence of the existence of the Supreme Being. The conclusion does not necessarily follow, however, as some have thought, that directed development in nature implies the immediate interposition of Deity. The theist is satisfied to believe that even the work of evolution is brought about by natural law, since his conception of the omnipotence of Deity makes of Him the ultimate ruler of everything in the universe. Moreover, the operation of complex law is regarded by the theist as stronger evidence of the existence of the Supreme Being than is the operation of simple law. Far greater intelligence is required to subjugate many laws than to subjugate a single law. A mediocre man can operate a neighborhood grocery store, but a super-

man is required for the operation of a railway system. In all human affairs the degree of the complexity of subjugated laws is an accurate measure of the intelligence of the individual in control. Wheelbarrows can be made by morons, but the production of automobiles requires the combined intelligence of a large number of diversified branches of modern civilization. The theist, therefore, will not be embarrassed if the future findings of science show that an almost infinite number of factors enters into the principle of evolutionary development. The mutual operation of a vast number of laws, all terminating in the progressive development of life, should be satisfactory evidence of the existence of a guiding hand behind their activities.

Doubtless the greater part of all the opposition that the theists have raised against Darwinism has been due to its doctrine of chance development. Theists are not unwilling that Deity should create the universe in any way that serves His purposes best, but the doctrine of non-directed development is not regarded as compatible with belief in the immanence of God. But today all these disconcerting factors have disappeared. The chance element in the development of life has been replaced by one of law and order. Evolution when properly understood is found to be a staunch friend of the believer in God.

CHAPTER XI

CREATION OF THE EARTH

If the term "creation", as employed in the heading of this chapter, is interpreted to mean the bringing into existence of the earth out of nothing, then its use is not warranted by the following discussion. Either of the terms "formation" or "organization" might be better, but with the understanding that "creation" means the orderly formation of the earth out of previously existing matter, it will be retained in the caption of this article.

The writer does not subscribe to the somewhat orthodox theological interpretation to the effect that the earth was brought into existence through a divine fiat out of a condition of nothingness; on the other hand, he holds that Deity is the actual creator of the "heavens and the earth", that He brought them into their present state of existence through the operation of natural laws over which He exercises control.

The researches of science have proved beyond question that the earth has been in process, of formation for periods of time almost infinitely long, measured probably in hundreds of

millions of years. Throughout these vast eons the laws of nature have slowly transformed the earth from a primitive beginning to its modern state of development. The present chapter will be limited to a consideration of the earliest phases of earth history; later phases will be discussed in succeeding chapters. That science deals with this cosmic period in terms largely of theories and hypotheses should not be interpreted to mean that nothing is definitely known of what took place during this time. On the contrary, we are familiar with many of the processes involved in early earth history; until much more is known, however, most of the details will continue to be largely hypothetical.

Before the coming of modern astronomy the earth was generally regarded as the center of the universe, around which the various heavenly bodies were revolving. But with the advent of the telescope and the still more wonderful spectroscope, all this was changed. We now know that the earth plays a rather unimportant part in the operation of even the solar system, and that, instead of being the center of revolution, it follows a regular path around a central governing body, the sun. By the use of the telescope we have brought these various bodies within close range of vision, where we can study their

movements and relative positions with much greater accuracy than could formerly be done. The spectroscope is rendering an invaluable service by acquainting us with their composition and their physical properties.

The earth is very small in comparison even with some of the other planets of the solar system, and particularly in comparison with the spaces that separate them. If the earth were to be thought of as being the size of a pebble half an inch in diameter, the sun would be represented by a ball four and one-half feet across and situated at a distance of five hundred feet. On the same scale the nearest star would be some 25,000 miles distant. The milky way, with its cloudlike haze extending across the sky, and based on the same diminutive scale, would be situated probably fifty million miles away.

This means, of course, that the earth comprises a very insignificant part of the stellar system. There seem to be millions upon millions of other bodies of equal importance; many of them are very much larger and others smaller; some are hotter and some are colder.

The earth is an integral part of the solar system, which is composed of the sun and its eight planets and their satellites. Any acceptable explanation of the creation of the earth

must, therefore, comprehend the entire solar system, but, of course, not the stellar system beyond.

A detailed statement of the exact origin of the earth is not possible. The earth's early history is so completely obscured in the dim record of the past that we shall probably never be able to decipher more than a general outline of its beginnings. At present we can do no better than to formulate hypotheses and modify them as our intelligence increases. An hypothesis should be regarded as a thesis or supposition provisionally and temporarily adopted to explain certain facts and to guide in future investigations. An hypothesis may or may not be true; further research may support it or may cause its abandonment. To be acceptable, however, it must be in harmony with all known facts pertaining to the subject in question. It incorporates the sum total of all relevent information at the time of its acceptance and it makes certain suppositions for future inquiries.

The high power telescope discloses the presence, far out in space, of vast quantities of seemingly unorganized material, familiarly known as *nebulae,* and which is plainly revealed by stellar photography. These vast patches of light exist in various forms, and, for sake of scientific

description, have been segregated into a number of types. Practically all of the hypotheses dealing with earth origin, in some way or other, regard this material as the stuff of which organized bodies are built.

As far back as 1755 Immanuel Kant advanced an ingenuous scheme by which the various planets were supposed to have been derived by means of the convergence of matter around certain nuclei, which, through growth, developed into the planets themselves. Kant's hypothesis, however, was never widely accepted, perhaps chiefly because it was not presented in really scientific form.

In 1796 Laplace, the French astronomer and mathematician, gave to the world the first hypothesis to attract widespread attention. The Laplacian or *nebular hypothesis* considers that the solar system began in the form of an enormous gaseous sphere, highly heated and extremely attenuate. Incident to cooling and because of unequal radial contraction, the sphere gradually became oblate, and, finally, through further shrinkage, left off a ring in its equatorial plane. Further differential shrinkage resulted in the separation of more rings until a total of eight had been left behind. Meantime the rings themselves had disrupted and the material compris-

ing them had accumulated around centers in the form of gaseous and, later, liquid spheres. Still later the spheres became solid on the outside and gradually took on a more and more solid condition within. The bodies that arose from the eight rings now comprise the eight planets of the solar system, while the sun is the residual central mass.

Under this hypothesis the earth is supposed to be still very hot within, as a result of its former molten condition. During the first half of the nineteenth century this hypothesis was widely accepted by the scientific world, but of later years objections have been raised against some of its most salient features, until at present it is regarded by but few people as offering an adequate explanation.

It is sometimes argued by the popular mind that because the nebular hypothesis has been abandoned, the scientific world was misled in accepting it and, therefore, that the time devoted to its consideration was uselessly expended. This, of course, is a mistake. Hypotheses are never permanent structures. They are not unlike the scaffold work utilized in constructing buildings; when they have served their purpose they are removed. Hypotheses are simply stepping stones from one set of truths to another. While

it is a fact that the Laplacian hypothesis has been largely abandoned, yet it has performed an invaluable service in the study of earth origin, and because of it and other considerations, we are gradually approaching the goal of a more complete understanding.

The so-called *Planetesimal Hypothesis* came prominently before the scientific world some twenty years ago; it was conceived by professors Chamberlain and Moulton of the University of Chicago. Since its appearance it has undergone modification in some of its more or less unimportant aspects; it is now favorably looked upon by a big majority of those who are prepared to judge of its merits. No one, of course, regards it as a complete answer to the matter which it attempts to explain. Time undoubtedly will bring about its revision, but at present its principal postulations seem to harmonize somewhat fully with most available information. Those who do not accept it, apparently have nothing better to propose. As it stands today, it comprises the best thought in the world upon the subject of earth origin. An outline of its principal features follows:

The planetesimal hypothesis traces the solar system back to an ancestral sun, probably much larger than the one from which we get our light.

Because of the close approach of a similar heavenly body, this ancestral sun was disrupted in such a manner that vast quantities of its its constituent material were thrown far out into space at tremendously high velocities. Some of the fragmental material was likely thrown so far that it passed beyond the gravitative control of the parent body and drifted out into space probably to form meteoric and cometary material for other systems. Other parts of the fragmental material possibly fell back into the exploded sun and were engulfed by it, and still other parts were deflected to one side by the gravitative pull of the passing star, and thereby made to revolve about the central mass in elliptical orbits.

The cause of the disruption of the parent sun is thought to have been due to the tidal effect of the neighboring stellar mass, the causes for which, however, can hardly be explained in an article of the present kind. Thereafter the body as a whole assumed the form of a great spiral nebula made up of countless numbers of individual fragments. Stellar photography has revealed the presence, far out in space, of vast numbers of spiral nebulae closely resembling the type from which the solar system is thought to have been derived.

Writers on the subject disagree as to the probable size of the individual particles comprising the nebulous mass. Some investigators have postulated that the material was largely dust-like in point of size, or even smaller, while others have insisted that individual fragments may have reached many miles in diameter.

The material comprising the two arms of the spiral nebula was clustered into a number of complicated groups, all of which revolved about the mass from which they were thrown. The individual particles possessed extremely high velocities and traveled along nearly intersecting orbits. Collision after collision followed in quick succession and gradually within each swarm the material was accumulated around a central nucleus. As a result of the collisions, both light and heat were generated, and simultaneously the various nuclei were being gradually transformed into future planets. Accordingly, the eight planets, including the earth, which now revolve about the sun, were brought into existence through the accumlation of this fragmental material around an equal number of nuclei, or centers. The moon is a large mass not swept up by the earth, and the sun is the original star, worked over after it had lost various fragments through disruption.

The accumulation of these rapidly moving particles resulted in the generation of vast quantities of heat. At the time the earth neared its full growth, it may have become liquid throughout; on this point, however, investigators are not agreed. (It will be well to note in passing that even though the earth was originally composed of planetary particles, its fragmental nature was wholly destroyed because of the recrystallization through which it is thought to have passed, and, therefore, that at present none of the original particles exists as such.) The heat necessary to produce this high temperature was probably derived from two sources; first, from the impact of the infalling planetesimals and, secondly, from the compression incident to the growing planet. It is scarcely necessary to think of the earth as reaching the white heat normally required to fuse such rocks as quartzite and granite, since it is known that when water vapor is present the temperature of fusion is reduced.

It is postulated by this hypothesis that practically all of the air and all of the water, now comprising the atmosphere and the hydrosphere, were contained within the original rock fragments and that as the earth gradually grew in size these materials were forced to its surface

because of the increasing temperature and compression within the growing planet.

For some time after its appearance, the atmosphere is thought to have consisted largely of a dense cloud of water-vapor hovering close to the earth and perhaps completely shutting out any light from the sun. This condition is pictured by the late Dr. Barrell of Yale University in the following language:

> The sunlight of the Primordial Era illumined and was reflected from the outer side of the mantle of cloud. The planet shone brilliantly by this reflected light, having an external appearance similar to that which Jupiter and Saturn still possess. Above the zone of cloud the carbon dioxide and other gases, with very minor amounts of water-vapor, extended with diminishing density as an upper transparent envelope.
>
> During the more rapid growth-stages the molecular and dust-like matter swept up by the earth settled like a never-ceasing cloud of volcanic ash. The planetesimals of sand and gravel size were swept up by the earth many millions of times more abundantly than are meteors at the present time. Those meeting the earth with the higher velocities were consumed by impact. Over the hemisphere of night the otherwise invisible atmosphere above the cloud canopy scintillated with incessant flashes of light and trails of luminous dust. Bodies of larger size gave in their dissolution a still more brilliant display and penetrated to greater depths. At longer intervals, with titanic rush and roar, a greater projectile, tens or even hundreds of miles in diameter, cleaved through the canopy of cloud, leaving a tumultuous maelstrom behind, drove almost unchecked through the deep and dense atmosphere below, and, with worldwide commotion, was engulfed, with development of fervid heat, within the molten sea.

The existence of water in the form of oceans was at this time an impossibility, since any water that may have been precipitated from the outside was quickly vaporized in the hot strata of the lower atmosphere long before the surface of the earth could be reached. Gradually, however, the earth's surface began to solidify and the temperature of the encompassing atmospheric blanket was correspondingly reduced. First of all the deluge of infalling rain was hurled back into space in much the same manner as when water is brought into contact with the surface of a red hot stove.

As the earth slowly cooled, however, the water gradually accumulated until it is thought to have covered the entire surface of the newly formed planet. There are good reasons for believing that the continents and the ocean basins had not at this time appeared, and, therefore, that the surface of the solidified globe was not marked by any major irregularities as it is at present. Accordingly, at this time there was probably but very little land protruding from the surface of an almost universal sea. The immediate point of interest is that before the continuously incoming waters could accumulate into ocean basins, as at present, a marked irregularity in topography had to be brought

about. It is thought that prior to this time the rock formations were either completely covered by water or that the water occurred in almost innumerable shallow basins separated everywhere by low-lying and partially inundated land masses.

Carefully conducted scientific investigations seem to indicate that at present the rocks beneath the oceans are notably more dense than those beneath the continents; some investigators believe that the greater part of this difference in density is confined to the outer fifty miles of the earth's crust. According to this view the continents are held in their superior topographic positions because of the higher density of the rocks forming the ocean floors. Furthermore, if the rock masses were of the same density it is believed that they would flow down by means of their sheer weight to a common level.

Just when this difference in density arose is not a matter of universal agreement. Early investigators place it far back when the earth was much smaller than at present, but more recent writers seem to feel that it came about even after the atmospheric waters had partially condensed, and, therefore, subsequent to the consolidation of the earth's crust.

It is believed by some scientists that the de-

pressions now forming the ocean basins owe their existence directly to the extrusion of vast quantities of heavy volcanic lavas. It has been experimentally demonstrated that solid rock will yield under high pressure in much the same manner that plastic clay yields under the hand of the potter. It is postulated, therefore, that when these enormous weights of lava accumulated within certain areas, the underlying rock formations yielded to the pressure and a gradual subsidance followed, accompanied by corresponding elevations elsewhere. According to this explanation, the depressed areas now form the ocean basins and the elevated areas, the continents.

We must not think of this vast crustal deformation as being completed in a short time, but rather as going on slowly over periods that would be difficult to state in years. Contemporaneous with the movement, the water gradually drained into the ocean basins and the continents slowly appeared.

Part of the oceanic waters was probably precipitated from the atmosphere, but the larger part is believed to have come directly from the interior of the earth, first in the form of gases and later as highly heated liquids. It is thought

that many of the hot springs now in existence are still issuing these "juvenile waters."

During the early formative period of the earth and while its surface was still very hot, water could exist only as gas in the atmosphere, but after the surface had become solidified and sufficiently cooled, the vapors condensed and were precipitated in the form of deluges of rain. Up to this time it is probable that the sun's rays had not reached the surface of the earth because of the dense atmospheric blanket surrounding it. As the precipitation continued, however, the atmosphere was gradually cleared, and slowly the sun's light began to illumine, for the first time, the surface of the new born planet. It is believed by some investigators that for very long periods of time thereafter, and probably even post-dating the appearance of plant life, the full glare of the sun was not capable of passing undimmed through the atmosphere to the surface of the earth.

With the first appearance of the sun's rays the earth's surface was dimly lighted and warmed, especially in the equatorial zone, and gradually thereafter the air was set in motion and thus gave rise to great series of systematic winds. Rivers began to follow newly developed channels, climates became equable, and

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CHAPTER XII

ORIGIN OF LIFE

Opinions differ concerning the probable date at which life first appeared on the earth. Some investigators, who reason from the planetesimal hypothesis of earth origin, feel that physical conditions capable of supporting life existed when our planet reached about the size of Mars, or when the earth's diameter was practically one-half as great as at present. Other investigators consider that the earth must have attained nearly its full size and that the climates had become more or less temperate before the existence of life was possible. Those who hold that life may have been generated under conditions of high temperature, logically place its advent at a time when the earth is thought to have been highly heated. Others who demand more temperate conditions usually place its appearance at a correspondingly later date. Of more recent years, and particularly since the coming of the planetesimal hypothesis, the tendency is to carry it farther and farther into the remote past.

The nature of the question relating to the origin of life is such that the ingenuity of man

may never be able to solve it. The problem involves so much speculation that it can scarcely be regarded as strictly within the field of scientific investigation; possibly it would be better within the domain of speculative philosophy. Writers on this subject, especially of more recent years, have been cautious to explain that their views should not be taken too seriously; moreover, the great diversity of conclusions that have been reached would seem to warrant this caution. There is probably no other field of discussion in which a wider and more indefinite variety of opinions can be found. This is, of course, due to the unique nature of the problem itself.

Speculation along these lines seems to be as old as civilization. Among the learned men of Greece, even including Aristotle, the idea was advanced that organisms, such as worms, insects, and fishes, actually sprang into existence from the mud along sea-shores, and particularly from stagnant pools. That this opinion was widely held is shown by the fact that it is voiced in literature of several centuries.

Various writers in medieval times described the creation of fishes and of insects as arising from processes of fermentation. It was even stated specifically that a decaying horse breeds

wasps, a mule produces hornets, and an ass gives rise to bumble bees. The following statement was voiced as a rejoinder to some one who had the courage to question the correctness of such views:

"So we may doubt whether in cheese and timber, worms are generated, or if beetles and wasps in cow-dung, or if butterflies, locusts, shellfish, snails, eels, and such life be procreated of putrefied matter, which is to receive the form of that creature to which it is by formative power disposed. To question this is to question reason, sense and experience. If he doubts this, let him go to Egypt, and there he will find the fields swarming with mice begot of the mud of Nylus, to the great calamity of the inhabitants."

A little later various investigators began to doubt the origin of life in such a manner. It was subsequently shown that when meat and similar forms of decaying matter were protected from flies, maggots did not appear. The fermentation and putrefaction of organic matter was demonstrated to be preventable when the material was placed in sterile surroundings. It is now well known that organic infusions do not develop living matter except when contaminated with extraneous materials. This great achievement, which is inseparably connected with the immortal name of Pasteur, has proved to be of particular value in modern medicine. Gradually the truth came to be recognized that

no forms of living matter are known to develop except in connection with pre-existing life.

Present theories relating to the first appearance of life upon the earth lead to a wide variety of conclusions. Some investigators have suggested the possibility that life did not have its origin upon the earth at all, but that it was carried from already populated heavenly bodies in connection with meteoric and other solid particles. According to this view, life may be as old as the universe itself and is simply transplanted from world to world as occasion arises. Others, who have seen some objection to the arrival of life in connection with infalling particles, have suggested the likelihood of isolated germs making the journey alone. Such men as Arrhenius, the great Swedish physicist, and others add plausibility to the view by asserting that this method of transplanting life does not appear to be impossible.

The greater part of present day theories, however, describe life as having been generated upon the earth, and at the particular time when physical conditions were favorable to the development of protoplasm. In some of the theories, heat plays the most important part, in others contain chemical compounds, and in still others coordination of elements.

Though there exists a great diversity of opinion relative to the details of this matter, yet there are some very important phases in which there is much uniformity of agreement. Life is everywhere known to exist only in connection with the chemical substance termed protoplasm. This compound is made up essentially of some of the most common elements, among which chiefly are the following: carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, potassium, calcium, sodium, chlorine, iron, and magnesium. It is noteworthy that none of these elements occurs exclusively in connection with life; on the other hand, they all occur in a great many ways quite independent of it.

Protoplasm is an exceedingly complicated substance, concerning which much still remains to be learned. The chief point of difficulty experienced in studying it, either in the chemical or the biological laboratory, is that as soon as living protoplasm is seriously disturbed, life separates from it. That which remains is simply non-living matter. Some one has suggested that we might as well try to study the operations of a great factory by analyzing the debris after its destruction. The properties of protoplasm are as intimately connected with life as is the whir of a well-regulated factory

with the individuals who operate it. When life is extinct or when the workmen have left the factory, that which remains is dead and motionless.

The invariable association of protoplasm with life has led to a general belief that life is in some way genetically related to it. That is, that life is a product of a definite arrangement of chemical elements, and, therefore, that it does not exist as a thing or a substance of itself. Inasmuch as any disturbance or rearrangement of the elements will cause life to disappear, it is conversely concluded that whenever a proper arrangement is established life will appear. In other words, according to this view, life is a condition *produced by a definite combination of chemical elements,* associated with proper physical environment.

An illustration may be obtained by noting what happens when other chemical substances assume certain relations. It is well known, for instance, that when carbon, in the form of coal, and oxygen, from the air, are brought together under proper conditions, say, in the household grate, the fuel "burns" and heat results. It is similarly known that under certain adverse conditions combustion ceases and the fire goes out. The fire is plainly the result of a definite con-

dition and when this condition disappears the fire ceases to exist.

Fire can scarcely be regarded as anything other than the outgrowth of certain favorable relations. Charcoal and oxygen may easily come into contact with each other without producing fire, as, for instance, the coal in the bin with the surrounding atmosphere. Or a fire may be extinguished through disturbing the proper relations by throwing water upon it. Fire is not looked upon as something independent of matter. It results from the activity of molecules induced by chemical union, and when the condition necessary to the chemical activity ceases to exist, the fire simultaneously disappears. Fire does not exist either before or after the burning, but only simultaneously with it.

Some investigators regard life in much the same light. To them it is not a *thing* or *something* of itself but simply the manifestation or product of certain arrangements of physical materials. It is assumed that when oxygen, hydrogen, and the various other elements comprising protoplasm come together under favorable conditions, life results, in a manner at least somewhat analogous to that in which fire is an outgrowth of the necessary chemical and physical relations. The unfailing presence of protoplasm

wherever life exists is regarded as the foundation for this argument, and, therefore, for the conclusion to which the argument ultimately leads.

This physico-chemical energy conception of life is now accepted as a working hypothesis by a large number of investigators. The explanation is scarcely more than a restatement of the old doctrine of spontaneous generation, yet from the viewpoint as expressed in preceding paragraphs, this belief is not equivalent to the generation of something out of nothing, since life is not regarded as a something but rather as a condition. Hence the spontaneous generation of life is thought to be not wholly unlike the spontaneous generation of fire or of any other phenomenon arising from the proper relation of materials.

Some of the more daring writers have suggested that new life may be coming into existence almost continuously and others that it would likely do so if it were not for the attacks of certain bacterial forms which prevent its appearance, but the more careful writers feel that the origin of life was limited to a single period in the remote past. Much speculation has been indulged in as to why life cannot appear spontaneously at present if it did so at some former

time, but seemingly no adequate answer has been proposed. It has already been pointed out that none of the hypotheses dealing with the origin of life should be regarded too seriously, yet in spite of this doubt and uncertainty there has arisen in many fields of investigation a well developed opinion to the effect that if we could look far enough back into the remote past, we would witness the development of living protoplasm from non-living matter. Even though the individual hypotheses are regarded by no one as attaining scientific standing, yet the opinion is widely held that something akin to what they attempt to explain must have actually taken place.

Believers in God and more particularly those who believe in the future existence of man, have come to regard this particular attitude as a more or less threatening one. If life is simply a condition that arises from a certain combination of chemical elements, it follows that when that combination is disturbed the condition ceases to exist. In other words, if this view is correct, it appears that life is simply a condition that comes and goes with the appearance and disappearance of certain physico-chemical arrangements. Accordingly, there is no such thing as the spirit of man existing independently of the body. When

the protoplasm making up the human body is seriously disturbed, it quickly dies and life ceases to exist. The logical conclusion seems to be apparent: Man does not possess a spirit; there is no resurrection, and, therefore, there is no future life.

People, who appear to take pleasure in believing that there is no hereafter and that the teachings of theology possess no reliable footing, frequently resort to this line of argument to bolster up their disbelief, and they are usually profuse in their statements to the effect that science has proved thus and so. It should be observed, however, that none of the doctrines postulating the spontaneous generation of life can possibly be accorded scientific standing. The question of the origin of life has not been answered by chemistry, by biology, by psychology, or by any other branch of science. Furthermore, no investigator would care to insist that the problem belongs to his particular field. The doctrine of the spontaneous generation of life is not based on scientific discovery, but rather upon assumptions that have arisen from certain deductions and analogies. It cannot be accorded the dignity of even a reasonable hypothesis, since there are no known facts to support it. Nevertheless, many scientists feel that something akin

to spontaneous generation may have actually taken place, yet their opinions in this matter are admittedly no more than acts of philosophical faith; they are not even based upon purely scientific reasoning, primarily because the problem is not regarded as approachable from that point of view.

The conclusion that life is a product of definite physico-chemical conditions is itself open to serious criticism. In the first place, it is based upon the erroneous assumption that because protoplasm is invariably associated with life, the two are genetically related. In its simplest aspect the argument asks us to believe that because life is never found apart from this chemical compound, and that because life disappears when the compound is disturbed, life itself is an outgrowth of the condition and ceases to exist when the condition no longer prevails.

It would be equally as reasonable to argue that the intelligence behind, say, a well-regulated factory is the product of so much steel and concrete and stone and wood, and that this intelligence ceases to exist when something, either great or small, causes the factory to suspend operations. The composition of the factory is probably more intricate than even that of protoplasmic molecules. It is made up of a much greater

variety of materials and of almost infinitely more parts. In order that the factory may work properly, its various components must all be designed for a common purpose. But to state that the operations of such an institution are the result of this combination of conditions, no matter how complex, would, of course, be absurd. Everyone knows that an intelligent working force is indispensably essential to the existence of any manufacturing institution, and, furthermore, that the intelligence exists entirely independently of it.

The inadequacy of the factory to operate alone is apparent when it is observed that if the management and the working force were to close its doors, even when every part was in perfect working condition, the institution would remain inactive for time without end, unless some one returned to put the wheels into motion.

There are two easily segregative factors in the operation of every manufacturing institution. There are the various materials of which it is made, all delicately and harmoniously adjusted to the general purpose of the plant, and there are the various individuals who operate it. Both factors are mutually dependent upon the other, and at the same time each can exist independently of the other. The chief point is that the

working force—management and laborers—is not a product of the plant, even though the one is associated with the other.

Putting the spontaneous generation idea into commercial terms, this is what its adherents would say: "A living factory is a highly complicated mechanism that produces a certain type of motion, and, at times even intelligence. This motion or intelligence is never present except when the component parts of the factory assume definite working relationships, and, therefore, the intelligence accompanying the factory is a product of a given arrangement of physical materials. This is proved by the fact that when the machinery or housing is injured the intelligence ceases to exist. The living factory, therefore, is nothing more than the result of so many walls, boilers, lathes, and other devices, all arranged in complete harmony with a common purpose. There is no intelligence or other working force connected with it, aside from that produced by the materials themselves."

The believer in spontaneous generation will likely object that the writer is *assuming* the presence of a living factor in connection with the mechanical protoplasm. Before a reply is made to this objection it will be well to examine into the methods ordinarily employed by the

average investigator. He carefully studies the protoplasm by means of chemical reagents and high power microscopes, and he accurately determines its chemical composition, and, so far as possible, its physical properties. In a word, he exhausts the resources at his disposal, and then he performs an unpardonable act against science and its high standards; he comes to the conclusion that because he cannot determine the presence of life *by means of the apparatus available to him* that life does not exist as a something of itself but that it is merely a condition.

The chemist might equally as well conclude that the power of reasoning in human beings is not present, because he cannot discover it in his beaker or his crucible, or the psychologist might declare that, say, water is simply a condition, because it does not respond to his laboratory treatment. But the opponent may press his point by stating that life as a something will not respond to analysis in *any* of our laboratories and that its reaction is everywhere negative. Here the unscientific attitude of the objector is again exposed, for certainly he is not prepared to state that our present methods of scientific and philosophic determinations are capable of investigating everything in the universe. We have much still to learn. There are yet many factors in the

operations of nature with which we are not familiar.

A few years ago the writer sat in the radio laboratory of his son and listened to a musical selection that was being played in a distant part of a busy city. The experience was made possible through the use of some recently designed apparatus. At the transmitting end a certain device was employed to hurl electrical impulses out into the atmosphere as the tones of the instrument impinged upon a sensitized diaphragm. At the other end of the circuit these impulses were intercepted by copper wire antennae from which they were conducted into the room where they were transformed into sounds.

If the entire population of the city had attempted, either in mass or individually, to detect the presence of these particular impulses, the effort would have been a failure. Negative results would have been obtained by the chemist, the psychologist, the physiologist, the bacteriologist, and even the electrician, for at that time this particular radio-operator possessed the only instrument in the city capable of detecting these impulses. To every other investigator their presence would have been negative, yet their existence was absolutely real. The objector might properly be asked what he would think of an in-

dividual who would deny the existence of radio waves simply because he had no means at his disposal of detecting their presence?

It is wholly unscientific for any one to state that life does not exist independently of matter, on the ground that it does not respond to some particular test or set of tests that he is prepared to apply. If this method were followed in other scientific investigations we would continuously be denying the existence of many of the best known phenomena. The chemist would deny the existence of everything that did not respond to his specific laboratory treatment, as would also all other investigators. The biologist would deny the existence of the water that we drink, the physiologist even the clothes that we wear. It is evident that in order to determine the presence of anything whatsoever, we must be prepared to apply the particular test to which the given substance will respond.

Those who do not believe in the existence of life independent of matter may feel that this type of argument removes the problem of the origin of life from the field of scientific investigation. It does not necessarily do so, although there is very grave doubt that it really belongs to the scientist. He has been considering it for

more than two thousand years and he appears to be as far from its solution as ever.

It is not impossible that the only test applicable to the question of the origin of life is the test of faith in God and of prayer to Him for enlightenment. Furthermore, it is not unreasonable to assume that the operations of God are founded upon law just as naturally as any of the physical things of the universe, and that when His claims are investigated they are equally as susceptible of demonstration.

The scientist has not yet learned how to investigate the question of the origin of life. The believer in revelation declares that he has discovered the secret. His claims must not be dismissed until his tests have been applied and until his declarations have been demonstrated to be untrue.

CHAPTER XIII

HISTORY OF THE EVOLUTION OF ANIMAL LIFE

As pointed out in a previous chapter, science has made no definite discoveries of the manner in which life had its origin on the earth. Even the form in which it initially appeared is wholly unknown. We know, however, that life made its appearance many millions of years ago, probably far back toward the dawn of the earth's history, and, furthermore, that the earliest forms were exceedingly primitive in comparison with those that followed.

The oldest fossils thus far discovered are the remains of animals rather than of plants, although it is confidently believed that if the entire history were available it would show that plant life made its appearance some time before animal life. This inference is based largely on the biological fact that the food of animals must consist partially at least of plant materials, while that of plants may consist wholly of substances obtained from mineral sources. It seems to be evident, therefore, that animal life could not have existed on the earth until after plants had

arrived and had provided a food supply for it. The absence of plant remains in the earliest strata containing the fossils of animals is thought to be due to the fact that the animals were much more readily fossilized than were the plants.

Examination of a modern beach will throw some light on the manner in which the history of animals and plants is recorded in the rock formations of the earth's crust. An abundance of life is present in the water adjacent to practically all sea shores. The nature of the life varies greatly from place to place with change of climate, depth of water, nature of materials comprising the beach, etc. After the death of these creatures, their bodies are disposed of in a number of ways, chiefly as follows; some are consumed by other animals, some are washed ashore and destroyed, and still others settle to the ocean floor where they are slowly buried beneath sediments derived from the near-by continents. In the course of long periods of time both the sediments and the more resistant parts of the creatures that are buried within them are converted into solid rock.

The animals that are cast up by the incoming tides on a modern beach are precisely similar to the living creatures in the near-by ocean. In

other words, the remains on the beach are indicative of the nature of the life living in the adjacent waters. If one should take the trouble to dig into the beach sands, he would find the remains of other and still other animals as he went deeper and deeper. It should be apparent to the reader without further comment that the fossils within the various strata are typical of the life that lived in the water at the particular time of their deposition. In fact, throughout the entire history of the earth, the remains of the creatures embedded in the rock formations form an index to the kind of life that existed at the time the various formations had their origin.

Aside from the vast wealth of fossils preserved in lake and oceanic sediments, other forms of animal and plant life have been preserved in swamps, in river deposits, in flood plain deposits, and even beneath layers of volcanic ash. In exceptional cases the remains of land animals have been preserved within layers of drifting sand. In California large numbers of fossils have been extracted from old asphaltic deposits.

The remains of water animals are much more abundant than the remains of land animals, chiefly because the habitat of the former is much more favorable to their preservation

than is that of the latter. After death, most of the bodies of the land animals lie on the open ground and are soon destroyed, while a much larger proportion of the bodies of the water animals are buried in sediments and are later fossilized. Yet, on the other hand, land animals are necessarily attracted to bodies of water, such as rivers, lakes, and swamps, since it is at such places that the demands for food and drink are most easily supplied. In addition to the creatures that formerly died and were buried in such places, it is known that occasionally an animal lost its life by venturing so far into swampy ground that it was unable to extricate itself. The upright position of a great fossil mammoth recently found near Spanish Fork, Utah, in the sediments of ancient Lake Bonneville, proves that the creature died in this manner. Furthermore, the bodies of land animals are frequently transported for some distance in flooded streams and later are stranded in deltaic and other deposits. Such is the origin of the great wealth of fossils at the dinosaur quarries south of the Uinta mountains.

Another point that sometimes confuses the layman is the manner in which the geologist determines the relative ages of the various rocks comprising the earth's crust. The numerous

layers, or courses, of brick comprising an ordinary building may be used to illustrate the manner in which this is done. In making the walls of a building, the masons begin at the bottom and build layer upon layer until the work is completed. In all such cases the relative time at which the various layers were placed in the wall is determined by their respective positions. The oldest layer is at the bottom, the youngest one is at the top, and the intermediate ones occupy corresponding positions between the two extremes.

The same principle is involved in the layers of rock comprising the earth's crust; the oldest layers, or strata, are at the bottom and the youngest ones are at the top. The earth's crust is made up essentially of a series of nearly horizontal rock layers, most of which contain the remains of the animals and the plants that lived at the time the respective strata were deposited. Many of the strata have been disturbed since the time of their deposition, so that now they may be horizontal, inclined, upright, or even overturned, yet by means of their position and the fossils that they contain, the trained geologist can easily determine their relative ages.

To each of the groups of rock formations the geologist has given a name. The names

also are applied to the time during which the respective formations were being deposited. Following are the major subdivisions of geological time, beginning with the youngest at the top:

Recent
Pleistocene
Tertiary
Cretaceous
Jurassic
Triassic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
Proterozoic
Archeozoic

Many efforts have been made to approximate the length of time that has elapsed from the beginning of the Archeozoic down to the present, and while the methods employed have been greatly diversified, yet the results are remarkably similar, in that they all point to an almost interminable period of time, at least a hundred million years long. Such a period is, of course, entirely incomprehensible to the human mind.

The development of life upon the earth as recorded in geological history forms perhaps the most fascinating story of any of the operations of nature. The story from beginning to end bears witness of the unerring accuracy and fairness with which nature works. Fortuity, or chance, is wholly absent; the operation of law is supreme. Details and generalities, alike, are equally subject to the same law. Justice and equity are administered with no favoritism and no discrimination. The following account is scarcely more than a summary of the chronological order in which the various animals made their appearance. Details could be recited only in a much more extensive article than present available space allows.

No direct evidence has been found, in the form of fossils, that life was present on the earth during Archeozoic times, yet from a number of inferential viewpoints we are led to the conclusion that primitive life must already have made its appearance. The absence of fossils can probably be explained by the fact that the rocks comprising these pristine formations have all been highly metamorphosed since the time of their deposition and, therefore, that any fossils that were formerly contained within them have been destroyed. Furthermore, it is thought that

the bodies of many of these primitive creatures were probably too delicate to admit of preservation in the sediments in which they were laid down.

During Proterozoic times, however, life is known to have been present, as proved by the fact that fossils have been found within the rocks of this period. The precise character of the life is but little understood, due to the fragmentary nature of the fossils thus far discovered. The life was extremely primitive and consisted of simple types of water living creatures. The geological record shows no direct evidence of the existence of plant life during the Proterozoic, yet, as pointed out above, it was doubtless present.

Within the Cambrian formations, however, fossils are extremely abundant and are so well preserved that species and even varieties can be identified. Every major subdivision of the animal kingdom is present except only the vertebrates, or creatures with backbones. Shelled animals that somewhat resemble modern clams, with numerous similar forms, constitute the principal groups.

In view of the fact that the Cambrian formations immediately overlie those of the Proterozoic, the layman might be led to believe

that the sudden transition from the poorly fossiliferous formations of the Proterozoic to the wealth of fossils in the Cambrian is indicative of a sudden appearance of life at the beginning of the Cambrian. This conclusion, however, is not warranted by fact. The explanation is not difficult. Between the Proterozoic and the Cambrian is a vast hiatus that separates these two periods by perhaps several million years. What, therefore, might be interpreted as the sudden advent of a great variety of animal forms is believed to be the result of gradual appearance, with a considerable part of the intermediate history destroyed. In still other words, it means that one of the early chapters of the history of life upon the earth is missing from available geological records. If it could be restored it would doubtless reveal a gradual transition of life from the simpler forms of the Proterozoic to the more complex ones of the Cambrian.

Throughout Ordovician and Silurian times life was not vastly different from that of the Cambrian, except that many of the older genera and species disappeared and new ones took their places. Water living creatures of the simpler types formed the dominating classes. Not long after the beginning of this period, however, cer-

tain forms of life came into existence which, before the close of the Silurian, terminated in the appearance of true fish. It is important for the reader to bear in mind that from this early date onward every major subdivision of the animal kingdom was continuously represented.

Devonian time was the age of fishes. Both in point of variety and of numbers, they have probably never been greatly exceeded in any other period of the earth's history. While in many respects they differed materially from modern fish, yet some of them might easily be mistaken by the layman for those that now live in rivers and oceans. Other forms of life were also abundant during Devonian times, principally the simpler types of water living creatures.

Throughout Carboniferous times, life forms were still further modified. New ones were almost continuously appearing and old ones, disappearing. It was also at this time that vegetation reached its first high point of development. During this period the amphibians, at present represented by frogs, toads, and salamanders, came prominently into existence. These creatures, as at present, lived partly on the land and partly in the water. The land surfaces as

a whole, however, were decidedly quiet so far as life was concerned. During subsequent time, particularly the Permian and Triassic, the amphibians took on a variety of grotesque forms and in some cases assumed gigantic size.

With the arrival of the Jurassic came the ascendency of the reptiles—creatures which for some time theretofore had been in existence, but which had been timid and comparatively unimportant. For some reason, as yet only partially explained, these creatures quickly developed and suddenly adapted themselves to almost every conceivable mode of living. At the beginning of the period they were small and probably of semi-aquatic habit, but they soon began to live on the land, in the water, and in the air. They varied in size from animals probably no larger than the horned toad of today up to gigantic saurians fully a hundred feet in length. There were animals that walked on four feet and others that walked on two, sometimes using an enormous tail as the third member of a tripod upon which they balanced themselves. There were also herbivores and ferocious carnivores. Still others of these diversified creatures developed the ability to fly; some of the larger ones reached a spread of wing of more than fifteen feet. There were also sea living

reptiles, many of which lost the normal use of their legs and gradually took on the external appearance of some of the larger modern fish.

Thus during Jurassic and Cretaceous times the reptiles diversified into a greater variety of forms and habitats than had been attained before by any class of animals. Their numbers were enormous; they overran the water, the land, and the air. Many of the great museums of today are well supplied with representative fossils of this splendid race.

Birds also came into existence during Jurassic times. It seems very probable that they had a genetic connection with the reptiles, since the two groups have many points in common, yet of the precise line of descent geology has at the present nothing definite to say.

At the close of the Cretaceous and the beginning of the Tertiary, another epoch-making event occurred. The great race of reptiles, which had been dominant for several million years, began to decline and in its place arose another group of animals even more powerful and in some respects more formidable than the one being replaced. This was the mammalian race.

Up to the beginning of the Tertiary true mammals (creatures that suckle their young) had probably not grown to a size larger than

that of some of our smallest domestic animals. With the coming of the Tertiary, however, and its equable climate, these creatures, like the reptiles of former days, slowly diversified into practically every possible form and entered every possible habitat. They, too, reached out into the land, the sea, and the air. They became carnivores and herbivores and they assumed a great variety of means of locomotion. They varied in size from diminutive creatures no larger than mice up to enormous mammoths, mastodons, and elephants.

During the Tertiary period all of the mammals now extant upon the earth had their rise and development. The bear, the deer, the ox, the elephant, the sheep, the whale, the horse, all arose and diversified during Tertiary times. Only minor changes have subsequently occurred. Thus, the close of the Tertiary witnessed the development of the earth and its inhabitants up to a stage almost equivalent to that of the present. All of the creatures now in existence had appeared and had taken on a modern aspect. Man alone had not as yet graced the earth.

The origin of man is thought to be of such importance that the following chapter has been set aside for its discussion. Some anthropologists place the beginning of the human race as

far back as the latter part of Tertiary times, and they will, therefore, disagree with the closing sentence of the last preceding paragraph, while others insist that the separation of man from the apes occurred during early Pleistocene times. Whatever this particular aspect of the case may be, man, as we now know him, with his present form of physique and intellectual capacity, did not come into existence before the late Pleistocene, and, therefore, not until after all the other animals had taken on a typical modern aspect.

By way of summary it will be well to note that life came into existence on the earth many millions of years ago. Of the very earliest forms we have but little definite knowledge, except that they were primitive and very simple in comparison with their later development. From the record of the Cambrian we have obtained definite knowledge of a widely diversified group of water living forms that represent all of the larger groups of animals with the exception of the vertebrates. During the Silurian the list was completed with the appearance of true fish. Next came the amphibians, the reptiles, the mammals, and lastly man. The history of this vast development reaches over a period of time probably in excess of a hundred million years.

In this connection the question naturally

arises concerning the genetic relationship between these various groups and sub-groups. Are they all descendants of a common parentage, and, therefore, do they form a continuous line of descent from the simplest forms of Proterozoic times down to and including man? Speaking for the great mass of scientists the reply would be an emphatic yes. That is, yes, in the sense of a deep-seated conviction, but scarcely as final knowledge. Recently, however, America's most prominent student of paleontology stated that the theory of organic evolution is now as well established as is the law of gravitation. This perhaps is placing the matter somewhat stronger than most scientists would care to do.

The geological record undoubtedly affords strong support of the theory of organic evolution. It begins with primitive, simple forms and it ends with modern, complex ones, and between the two extremes it supplies almost every conceivable intermediate type. The science of paleontology is scarcely more than half a century old, and, therefore, it has not been able to give attention to more than an exceedingly small part of the problems that fall within its domain. A genetic connection has been proved to exist between only a few of the various groups of animals, but this is probably due to lack of fa-

miliarity with their history rather than to an actual absence of such relationship. Wherever attention has been given to details the findings have uniformly supported the doctrine of continuous development. The horse, for instance, has been traced from a small, four-toed creature, scarcely more than a foot in height, to the great one-toed horse of modern times. Excellent work has been done in connection with the whale, the elephant, the giraffe, the rhinoceros, and many other forms. It is believed by the geologist and the paleontologist that when sufficient time has been devoted to the problem of life history on the earth, a genetic relationship will have been established between all of the groups, small and large.

CHAPTER XIV

THE ORIGIN OF MAN

At some time or other every normal human being has seriously asked himself the question of his own origin. The conclusions that are reached as a result of this query are almost as varied as the number of individuals making it, yet in the main they may be grouped into two classes—those that involve "super-natural" forces and those that involve natural forces only. The Biblical account of man's creation is ordinarily thought of as typical of the one, and the "descent of man", as usually interpreted by the layman, as typical of the other. It is held by some people that the two accounts are just about as opposite and incompatible as two ideas can possibly be. They feel that either the one or the other must be wrong, since the two explanations are believed to proceed along widely divergent lines. Of this matter, however, more will be said later.

To do justice to the historical notions that have dealt with the origin of man much more space would be necessary than is available in the present chapter. Not a few of the older beliefs

involved the idea that man was literally moulded from the clay of the field, and that through the operation of a supreme power, this inanimate mass was transformed into a living being. Other theories explained that man originally sprang from various animals, birds, and even plants. The belief is also held that man is intimately related to the animal kingdom because of the supposed reincarnation and transmigration of the soul.

The most familiar explanation, however, is the one outlined in the Book of Genesis. The remarkable similarity of this narrative to others formerly held by ancient heathen people has given rise to the criticism that the Bible story is not a product of the Israelites, but rather that it was borrowed from some other source and later incorporated into the scriptures. We must content ourselves with the reply, however, that even if the accusation were true it would not necessarily detract from the validity of the explanation, since truth should be accepted even if it comes from heathen sources. An effort will be made in the following paragraphs to determine the meaning of the Biblical account, irrespective of the origin of the narrative itself.

The wording of the account is concise, direct, and, at first, apparently unambiguous.

"And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul." Among orthodox Christians this statement is often interpreted to mean that Deity actually moulded man out of dust, in much the same manner as clay is fashioned in the hands of the sculptor.

The interpretation just alluded to, however, is not the only literal meaning that can be attached to the statement. The account simply says that God *formed* man of the dust, but it furnishes no clue as to how this *forming* was accomplished. It is well known that every human body is literally *formed* of the dust of the ground. Every element of which the body is composed is not only present in the dust but is actually derived from it. Following embryonic conception, the body increases in size through the food ingested by the parent, and, after birth, by the individual itself. No one will deny that our bodies are made up of what we eat, and that the food is derived from the ground. Moreover, no believer in the immanence of God can doubt that our present bodies are just as literally the workmanship of Deity as if He had fashioned them from clay with His own hands.

It is not unreasonable to believe that the

Genesis explanation might properly be construed to mean that man had his origin through the ordinary process of procreation and growth. This interpretation, of course, implies a pre-Adamic race, and incidentally it might be added that those who hold this view are not entirely without evidence to support their belief. Some Christians teach that Adam was transferred to the earth from another heavenly body, while others believe that he probably had a long line of earthly ancestors.

Concerning the manner of man's origin, however, the Biblical account is remarkably quiet. The narrative simply states that man was *formed* from the dust, but of the particular way in which this was done it leaves the reader uninformed. The Biblical statement, in its literal form, might be interpreted with equal justification to mean either that man was moulded from the dust or that he descended through procreation. There is no justification, however, for the belief that the term *formed,* as used in this connection, can mean nothing but *moulded*.

It is not an uncommon practice on the part of theologians, who hold the "plastic clay" idea of the origin of man, to refer to this particular interpretation as the "Biblical account of the creation" and to denounce anyone as an unbe-

liever who does not subscribe to the identical meaning thus placed upon it. As a matter of fact, the Bible is wholly silent as to the precise *manner* of man's origin. This same attitude is also assumed by some of the theologians who do not believe the doctrine of organic evolution. By such people the "evolutionist" is not infrequently regarded as an unbeliever in the "Word of God"; whereas the "evolutionist" may be fully as devout as the theologian in his acceptance of the Biblical narrative. The difference of opinion exists only in the matter of the meaning of the narrative, and not in its truthfulness.

It should be apparent to careful readers that the Biblical narrative does not attempt to explain the manner of man's origin. On the other hand, it emphasizes the fact that God is the author of man's existence, and, furthermore, that man was fashioned in the form of Deity. Elsewhere the record even states that human beings are His "offspring".

If God were to repeat the story of man's origin He would probably clear away many of the obscurities surrounding the account contained in the Jewish scriptures. Doubtless, however, as people become more and more anxious to know the truth, He will supply means for

their enlightenment, but no one would care to say whether this enlightenment will come as a direct revelation from God or through the researches of science.

No paper dealing with the origin of man would fairly cover the field without devoting a comparatively large part of the available space to findings of science. Of recent years the anthropologist has devoted much attention to the question of man's origin, and while his findings are far from complete, yet he has discovered indisputable evidence that seemingly points to man's development from lower forms of animal life. An effort will be made in the following paragraphs to outline the evidence thus obtained and to give each item its proper weight.

It appears that the Frenchman, Buffon, was the first scientist in modern times to grasp the idea of man's evolutionary development. In 1749, and still later in 1766, he gave expression to various opinions that leave no doubt as to his belief that human beings and certain lower forms of the animal kingdom are genetically related.

In 1809, the second French evolutionist, Lamarck, announced his belief in the anthropoid origin of man. He supported his argument principally from comparative anatomy. While he

recognized the great superiority of man in his upright position and his high mental capacity, yet he explained that these characteristics were brought about through long periods of evolutionary development. It was only a few years after the publication of Lamarck's views on this matter that the earliest discoveries of the industry of cavemen were found in France and Belgium.

The great English geologist, Sir Charles Lyell, was profoundly impressed in his later life by the work of Lamarck. In his famous treatise of 1863, *The Geological Evidence of the Antiquity of Man,* he further outlined the argument of comparative anatomy and gave to the world for the first time evidences from the geological record. It will be remembered that some seven years previous to this time, the so-called "Neanderthal" man had been found near Dusseldorf, Germany, and had been identified as a primitive human being of comparatively low brain development and probably of unusual bodily vigor.

In 1871 Charles Darwin published his *Descent of Man,* which almost immediately threw the weight of the greater part of the world against him. He approached the problem from a number of angles but, strangely, he gave very

little attention to the Neanderthal discovery. With the possible exception of the doctrine of *Natural Selection,* Darwin's theory of the origin of man constitutes his most widely known contribution to the scientific world. It will be well to bear in mind, however, that he was not the sole originator of the idea.

Darwin's doctrine of the origin of man is now interpreted by most laymen to mean that man sprang directly from the monkey. This meaning was, of course, never intended; on the contrary, the theory plainly states that back in geological time both men and the anthropoid ape arose from a common ancestry. The doctrine can easily be understood if we think of each of these two groups (men and monkeys) as representing independent branches, which in their backward extension unite into a single limb. The division is thought to have taken place probably more than half a million years ago. Since the time of the separation, which at first was probably very slight, each one of the branches has diversified along a number of lines, so that now the two end-products are in many respects remarkably dissimilar.

To definitely prove the anthropoid origin of man from the geological record, it would be necessary to trace the history of both the man

and the ape back through two long lines of ancestors until they merge into a common stock. The skeletal remains of these creatures, when discovered in sufficient quantity, should show a gradual transition from the present forms back into the aboriginal type. Exceptions to this gradation would, of course, here and there be expected, due to variations in climate, habit of living, etc. Even retrogressions might be looked for in certain instances. These exceptions, however, would be merely modifications of a general trend of progressive development.

The difficulties encountered in searching for the remains of these hypothetical ancestors of the human race are very great. Aside from the fact that the aboriginal creatures were few in number, they probably had but a single place of origin. Of the location of this place nothing positive can be said until after much more work has been done. Anthropologists rather generally agree, however, that the original home was probably in southern Asia. After, however, the human race had become pretty well differentiated from the lower forms of animal life, various tribes likely migrated into different countries and established themselves as independent peoples. In consequence of this probable migration, it is believed that the remains of the

more recent individuals exist over a wider range of country than do those of the primitive race.

For more than half a century the search for these supposed ancestors of man has been almost continuously carried on. Some people feel that the fossils thus far discovered have easily compensated for the effort, while others insist that the discoveries have been wholly incommensurate with the time and the money expended. It cannot be denied that the reward is not so prolific as that which follows the search for the remains of most animals. The evolution of the horse, for instance, has been worked out in much detail, and yet the efforts thus expended have been slight in comparison with those devoted to the search for the remains of human beings. On the other hand, the camparative sparsity of aboriginal man is probably responsible for the small number of remains thus far recovered.

Before an intelligent discussion can be made of the fossils that have thus far been found, it will be necessary briefly to outline certain climatic and other conditions that immediately preceded the present period of man's existence. During this period, known in geology as the Pleistocene, great ice sheets covered the larger part of North America and certain sections of

Europe and Asia. The Pleistocene consisted of four periods of maximum ice occurrence, separated by three inter-glacial periods, during which the ice largely disappeared, entirely in certain localities. The Pleistocene, or Glacial, period began about 500,000 years ago and closed about 25,000 years ago. Most of the human remains thus far recovered are in some way or other associated with deposits of Glacial or post-Glacial times, and hence in this manner their relative ages are determined. The greater part of the skeletons are of post-Glacial age, and, therefore, come within the last 25,000 years of the world's history.

The accompanying tabulation, adopted largely from Osborne's *Men of the Old Stone Age,* should assist the reader in estimating the value of the material at hand. The table does not show the complete list of discoveries representing the Neanderthal, Cro-Magnon, and later races, but it is sufficiently complete for the present purpose. The discoveries date from as far back as 1848 to as late as 1911; in fact, some additional Cro-Magnon skeletons were found as recently as 1923. The search for further material is being vigorously crowded.

Geological Period	Duration in Years	Race	When Disc'd	Locality	Character of Remains
		Furfooz Ofnet	1867	Furfooz, Belgium	2 skulls
Post-Glacial	25,000	Cro-Magnon	1868	Cro-Magnon, Dordogne	3 skeletons
		Grimaldi	1901	Grimaldi Grotto	2 skeletons
IV Glacial	25,000	Neanderthal	1848	Gibralter	Well-preserved skull
3rd Inter-Glacial	100,000	Piltdown	1911	Piltdown, Sussex	Portions of skull and jaw
III Glacial	50,000				
2nd Inter-Glacial	150,000	Heidelberg	1907	Heidelberg	Lower jaw with teeth
II Glacial	50,000				
1st Inter-Glacial	75,000				
I Glacial	25,000	Pithecanthropus (Trinel)	1891	Trinel River, Java	Skull cap and femur

In 1891 Eugen Dubois, a Dutch army surgeon, discovered the Pithecanthropus material near Trinel in central Java. In his search for human remains among the deposits along the Bengawan River, he found numerous mammalian bones, and finally a tooth, which he first thought to belong to a new species of ape. Subsequently he found the top of a skull about three feet distant from the tooth, and still later, a femur, or thigh bone, some fifty feet away from the skull.

Much discussion has taken place concerning the value and meaning of this material. Most specialists agree that the thigh bone is that of a creature that possessed the power to walk in an upright position, and that the creature, judging from the skull-cap, stood about midway between the most advanced anthropoid ape and man. The various restorations which have been made of this creature are based on the assumption that the thigh bone and skull-cap belong not only to the same race but also to the same individual; this assumption is, of course, open to question. The small amount of material discovered and the uncertainty of its belonging to the same animal render the conclusions more or less unsatisfactory. Various efforts have been made to add to the material collected by Dubois but with little or no success. For many years since its discovery the original material has not been available for study, but within the past few months it has again been examined by specialists who reaffirm their conviction that it belongs to primitive man.

While Pithecanthropus closely resembled the theoretical original human being, yet it possessed certain characters that have led authorities rather generally to reject it as a progenital form of the human race; in other words, while

this creature may have actually been a primitive man, yet the subsequent races did not descend from it. The discovery is exceedingly interesting, however, in proving the presence, far back in pre-historic times, of creatures that closely resembled man and that differed materially from the apes.

Another highly important discovery has been made near Heidelberg, but unfortunately the material consists solely of a lower jaw and attached teeth. It was found in old river gravels at a depth of 79 feet from the surface. No other traces of the skeleton have been recovered. The jaw is heavy and massive, mounted with relatively small teeth, which, in the opinion of those who have given the matter careful attention, possess undoubted human characteristics. The jaw is probably more powerful than that possessed by any human being at the present. Some investigators regard the Heidelberg people as direct ancestors of some of the more recent races, yet these conclusions are based on evidence afforded by a small part of a single skeleton.

The Piltdown skull, discovered in 1911, is in many respects one of the most interesting forms with which modern science has become acquainted. The material consists of some fragmental parts of the skull, parts of a jaw

bone, and some of the teeth. The skull was identified as that of a human being of about medium brain capacity. Some of the skull bones are unusually thick, which is interpreted to indicate a close connection with primitive types, yet, on the other hand, the skull presents certain features, notably the absence of eye-brow ridges, which are characteristic only of a high order of development. For some time after its discovery the Piltdown man was widely described as half human and half ape, and some excellent restorations of this supposed individual were made, but of recent years the U. S. National Museum has asserted that the jaw and the skull belong to entirely different creatures, the one to a chimpanzee and the other to a man. This disclosure, if correct, nullifies many of the descriptions which have been made of the "ape-man" of Piltdown. Discoveries of still more recent date, however, are thought to confirm the original interpretation.

Next in order of age is the Neanderthal race. These people are known from large quantities of material, including several skulls and nearly complete skeletons. There seems to be little room for doubt that the Neanderthal race were real human beings; they possessed certain characteristics, however, that readily distinguish them

from most modern peoples. The mean brain capacity was as great as that of many present-day Europeans, and averaged close to 1500 cc., while that of modern man ranges from 950 cc. to 2020 cc. The individuals were heavy set and seldom exceeded five feet five inches in height. The head was somewhat heavy and massive, and was characterized by prominent eye-brow ridges. In the latter feature the people probably resembled more closely the higher types of apes than do any of the living races. It should be remembered, however, that the Neanderthal people are thought to have became wholly extinct, and, therefore, they are probably not ancestral to any of the modern races. Toward the latter part of their existence they showed unmistakable evidences of rapid decline.

The Grimaldi race is known by two skeletons. These people were small, not greatly exceeding five feet in height, and possessed a number of negroid characteristics.

Following the Neanderthal and the Grimaldi races came what might properly be called the miracle of the anthropological world. This is the great Cro-Magnon race. It is doubtful that the earth has ever been graced by a people physically superior to them, not even excluding the highest races of present day civilization. These

wonderful people reached an average height of nearly six feet, and the males not infrequently as much as six feet four inches. Their heads were practically masterpieces of human perfection, both in point of size and of proportion. That they attained an advanced stage of civilization is shown not only in the implements and the carvings that they produced but also in the paintings that they made on the walls and roofs of the caves in which they took shelter. But for some reason, as yet largely unexplained, these interesting people finally declined and at length completely disappeared. Some investigators have thought that certain European and probably Asiatic peoples are descendants of the Cro-Magnon race, but as yet this is largely hypothetical.

Following the Cro-Magnons were several races of decidedly inferior peoples, both in point of physical development and of civilization. Their bodies were comparatively small and their cranial capacity was decidedly inferior, as was also their art and their workmanship.

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The foregoing is a brief review of the known geological evidence of man's supposed ancestry. Limited space is responsible for the brevity of the description and for the failure to mention

numerous discoveries of minor importance. Many well informed investigators regard the evidence already discovered as proof of man's anthropoid origin, while others, perhaps equally as well informed, see serious defects in its conclusiveness. A brief summary may assist the reader in determining just what has been accomplished and what yet remains to be done.

Judging from the skull-cap of Pithecanthropus, the creature was not entirely human, yet it was highly superior to any of the modern apes. Specialists, however, do not regard Pithecanthropus as being in the direct line of modern human progeny. The Heidelberg race is known by a single jaw bone, the teeth of which are decidedly man like, yet the jaw itself is unusually massive and heavy for that of a human being. Far reaching conclusions cannot, of course, be drawn from such meagre evidence. The Piltdown man, as known from the fragments of a single skull, was in many respects decidedly modern in general appearance, especially in the almost complete absence of eye-brow ridges, yet the skull bones are unusually thick and massive. The Neanderthal race, which followed the Piltdown, was more primitive in form of skull than the Piltdown itself, especially as shown by the presence of heavy eye-brow ridges, yet it will be

well to remember that even these people had a brain capacity as large as that of many modern Europeans. The Grimaldi people were diminutive, much smaller than any of the races that preceded or followed them; they possessed certain evidences of probable African origin. Next in order of appearance were the wonderful Cro-Magnons with their almost incomparable physique and cranial development. Following them were the retrograde races from which the present human beings are thought to have been derived.

The researches of anthropologists have thus proved the existence of many races of human beings of which nothing was known at the time that the investigations began. They have shown that most of these pre-historic peoples were inferior to present day races. They have proved the existence of certain creatures (Pithecanthropus and others) of much higher mental capacity than the anthropoid ape and yet of much lower than that of man.

Anthropologists, however, have failed to prove that Pithecanthropus was in any way genetically related to modern human beings; in fact, it is widely admitted that the creature is not one of man's progenitors. They have failed to prove the existence of a gradual trans-

ition from lower to higher types; in fact, there are nearly as many reversions as there are advances. They have even failed to prove the genetic relationship of any of the races one to the other. It is admitted that none of these races is the descendant of any of the others, but rather that all are descendants of an hypothetical parentage existing somewhere, perhaps in Asia.

Failure, however, to prove the genetic relationship of any of the various tribes to one another or to ourselves should not be regarded as evidence against the evolutionary development of man; it simply enlarges the task of the anthropologist and postpones the time of the final conclusion as to man's origin. The anthropologist appears to be perfectly reasonable in his assertion that in the past, as at present, numerous human races inhabited the earth. If this is the case, all of the discoveries should not be expected to fit into a single line of descent but rather to represent individual races which in course of time may be traced back to a single ancestral stock.

To assert as some theologians do that science has failed utterly in its search for evidence connecting man with certain lower forms of life could be done only by ignoring very pertinent discoveries. While the evidence thus far gath-

ered is not conclusive, yet no one, who has gone over the matter with unbiased mind, will deny that it is very suggestive.

On the other hand, to say that man's connection with the anthropoid ape has been finally proved would be making a statement not borne out by fact. Yet this attitude is assumed by many anthropologists, too many of whom take for granted man's connection with the lower animals, and then proceed to discuss various details as if the principal thesis had been settled. In assuming this attitude the anthropologist does an injustice both to himself and to his profession; no one thoroughly trained in the spirit and methods of science can justify himself in drawing a final conclusion until the data are all in.

The anthropologist unquestionably has developed some very interesting and very suggestive evidence that seems to be growing stronger as time passes, but many gaps will necessarily be filled before conclusive statements are warranted. What the final outcome will be no one possessing merely human foresight can definitely say. Future discoveries may provide the long looked for evidence, or, on the other hand, they may disrupt present theories.

In the meantime the searcher after truth, whether theologian or scientist, must stoutly

maintain his determination to learn the full facts in the case and then to accept them.

The reader should keep clearly in mind that the search for the origin of man is not a question as to whether or not Deity is the author of his existence. On the other hand, the question is merely one of *how* man reached his present state of development. The Biblical account of creation furnishes the information that man was *formed* of the dust of the ground, but it provides no clue as to the means employed in bringing him into existence. The doctrine of the anthropoid origin of man is not opposed to belief in the immanence of God; it simply attempts to explain the way in which nature operates.

CHAPTER XV

THE BIBLE AND ITS CRITICS

The Bible has been the object of more adverse criticism than probably all other historical records combined, yet it has emerged from the attack practically unharmed. During the period of skepticism that marked the closing decades of the last century, it was assailed more vigorously than at any other time. Atheists saw, or thought that they saw, in the explanation of the origin of things by means of natural law, a complete negation of certain parts of the Bible. The developments of science seemed to prove that not only the earth but the living organisms upon it had been in course of evolutionary development for periods of time almost infinitely long. The Bible, on the other hand, had been widely interpreted to state that the heavens and the earth, including all living things, were created in a period of six days. The conclusion of the disbeliever was, of course, that the Bible is wrong.

Numerous attacks were directed against other seemingly vulnerable points. That Joshua should command the sun to stand still, and

thus prolong the day, in view of our knowledge that the earth is moving and not the sun, was regarded as proof that the prophet was ignorant of these conditions and that his story is necessarily untrue. What the prophet should have done, according to these critics, was to have commanded the earth to stand still; if God really inspired the prophet, He would not have permitted him to make a statement of this kind.

Then again, in the case of the children of Israel crossing the Red Sea, the Bible narrative states that through the power of God their leader rolled back the waters and the people went through dry shod, and that the oncoming Egyptian armies were enveloped in the returning waters and drowned. The critics assert that even if the account were true, it should not be regarded as miraculous, for the reason that a great wind may have swept the waters back and that the Israelites chanced to be there at the opportune time, while the Egyptian armies were less fortunate.

The story of the deluge has come in for its full share of criticism. The skeptic argues that the period of forty days rain is ridiculously short in which to bury all land masses. Then too, there is not sufficient water in the earth's atmosphere, even if it were all precipitated, to

bring about this universal submergence. The time involved in the disappearance of the water is similarly inadequate. Finally, this vast amount of water would more than saturate the atmosphere, and hence total evaporation would be impossible.

An outline of this materialistic criticism might be extended almost indefinitely. If there is any important phase of the Bible narrative against which it has not been directed, one would have difficulty in finding it. No part has been too intricate and no part too sacred.

In the main, the effect of this criticism was two-fold; first, it destroyed the faith of a great many who had previously regarded the Bible as more or less infallible, and, secondly, among those who did not abandon the scriptures, it brought about a marked change of attitude toward the Bible and its teachings. This change of attitude was enforced by the conviction that there were but two alternatives; (a) the Bible as a guide in religious matters must be abandoned, or (b) it must be interpreted in the light of modern scientific and philosophic findings.

As an outgrowth of this situation, students of the scriptures almost everywhere set about to explain the Bible in terms of modern-day en-

lightenment. Parenthetically it might be said that this movement was in reality a commendable one, provided that it had been restrained within reasonable limits, but when a pendulum swings it rarely stops until after the two extremes are reached. This seems to be especially true when great masses of people are involved: their numbers give the movement a corresponding momentum.

Accordingly, the pendulum swung until practically every incident related in Bible history was given a new meaning. Many of the principal narratives came to be regarded as myths and fables, told to teach an underlying truth. We are asked to believe, for instance, that the account of creation, of the flood, of the healing of the leper, all have "deep seated meaning far superior to the circumstances which they appear to relate" and that the stories are simply vehicles that carry infinitely more important messages.

Even the personality of God has been brought into question and it is now widely taught by churchmen that Deity is an impersonal being, who possesses practically none of the attributes of man. The account of God walking with Abraham upon the plains of

Mamre must not be taken too literally, because, the critic argues, He possesses no body. The statement that man is made in the image of God, that we are His offspring, that Jesus ascended into heaven carrying with him a body in form like that of man, all these accounts, the average churchman says, mean something other than that which they tell.

God is almost everywhere regarded as a great power, or energy, or something, existing everywhere yet at the same time He is centralized at no particular place. Anyone who thinks of God as being in the form of man is looked upon by most theologians as ignorant and far behind the times. In speaking of this change of attitude towards the characteristics of God, a prominent scientist and churchman recently called attention to the famous picture by Michael Angelo, in which Deity is portrayed in the form of a magnificent man. In contrast with this, and typical of the modern conception, he further called attention to the mural painting by John Sergent in which Deity, though present, obscures himself behind a cloud. God cannot appear to mortals, because His form is not known to them; neither can they look upon His face and live. This same author goes on to say that while Angelo's canvas, with its personal God, is mar-

velous for its time, "yet no painter would think of repeating its conception today".

Thus the criticism of the Bible, which was instituted by disbelievers in God, has swept through the church like a devastating fire. Preachers, who at first vigorously protested against the movement, later aligned themselves with it, and, apparently, did everything in their power to hasten its spread, until today it has reached the remotest parts of Christendom. Only here and there in the path of this great "reform" were isolated fragments of the older conception passed by and left unconsumed.

Some one has said that the initial skeptic—the atheist—has more than realized his highest hopes. He started out by telling the churchman that the Bible was unreliable because it is not founded on fact. The churchman promptly denied it, and then almost immediately proceeded to inform his congregation that the Bible does not mean what it says, and that the true interpretation lies far beneath the surface. In other words, the churchman simply acceded to the argument of the disbeliever but would not admit it.

The writer would not knowingly disparage any movement designed for a better understanding of the Bible. Quite to the contrary, he fully

and heartily welcomes it. He sees in much of the criticism that has been directed against the older interpretations of the Holy Scriptures a force for good, but he deplores the fact that the average preacher has been practically swept off his feet by it. We, of course, cannot understand the scriptures without much familiarity with the details under which the particular incidents were enacted, and the more we are acquainted with the details the better our interpretations should be; but a study of the scriptures should not result in a denial of their principal asseverations. The writer, therefore, regrets that the average preacher has gone so far toward accepting the atheist's estimate of the Bible. There seems to be no justification for so complete a surrender.

Another aspect of the subject is of vital importance. The disbeliever has attacked the validity of the Bible primarily on the ground that some of its teachings are not strictly similar to current information regarding the points in question. He has insisted, for instance, that the accounts of the flood, of Joshua's commanding the sun to stand still, and of the origin of the earth itself could not have been inspired by Deity because they do not measure up to the truth as we are acquainted with it today. Inasmuch,

however, as the disbeliever in the Bible is almost invariably a staunch advocate of the doctrine of evolution—the doctrine of progressive development—he should not be unwilling to have his arguments examined in the light of his own method of attack.

One of the fundamental principles of the doctrine of evolution is that human beings may be progressive in both ontogeny and phylogeny, that is, during the lifetime of the individual and the lifetime of the race; in other words, the lifetime of the individual recapitulates the lifetime of the race. Just as there are periods of infancy, youth, maturity, and old age in the individual, there are corresponding periods in the race.

Recognition of this principle of development is fundamental in all educational activities. Perhaps the chief outstanding doctrine of modern pedagogy is that the material given to the pupil must be adapted to his particular grade of development. Methods and explanations suitable for use in the kindergarten are wholly out of place in the high school. Successful teaching depends upon the ability of the instructor to present the subject-matter in such a manner that it can be understood by those for whom the lesson is intended.

This method is illustrated by the manner in

which we teach, say, geography and related subjects. When the child is sufficiently developed he is told by the teacher that the earth is round like a ball (something he is familiar with). He is not told more because this is all he is capable of grasping for the time being. Later he is told that the earth is flattened at the poles—and again he has reached the limit of his understanding. Still later the configuration of the continents and ocean floors is studied and finally he becomes acquainted with disturbances due to orogenic, epeirogenic, and general isostatic readjustments.

It would not only be ridiculous to attempt to teach the child all that the educator knows about geography and geology; it would be absurd, impossible. Even if an average adult should listen to a dissertation dealing with crustal deformation arising from isostatic displacements, he would probably not understand a single vital step in the explanation.

So it is in the development of races. The nature of truth assimilable to the savage is far different from that assimilable to the college professor. Yet, if the doctrine of evolution——the doctrine of progression—be true, the former may, in course of time, be transformed into the latter.

With perfect propriety, therefore, the skeptic might be called upon to explain why he insists that Deity, speaking to the Israelites 4,000 years ago, should describe the origin of the solar system, including the earth, in terms of modern astronomy and cosmogony. If He should have done so, what would have been the result? In the first place, the ancients would have been unable to understand His explanation, and, secondly, the generations yet to come would complain, as we are doing at present, that the descriptions were *too simple,* and that they contained *too much error,* since no thinking person will maintain that our present theories are without fault.

In this respect the demands of the skeptic are unreasonable. He, above other men, boasts of his belief in the doctrine of evolution, yet in substance he insists that Deity should override this law in His messages to human beings. On the other hand, it should be expected that Deity, the greatest teacher in the universe, He who understands every law governing the progression of mankind, would teach men in terms of their ability to understand.

It should not be a source of surprise, therefore, that many of the scriptural narratives, intended for ancient Israel, appear to us, at least

in places, to be primitive and even crude. It is not difficult to understand, for instance, why Israel was taught that the earth was created in a period of six days. What would it have meant to them if Deity had spoken of the immense creative periods that modern geology and biology seem to have established as necessary? The message would have gone over their heads and the lesson would have been lost.

It should be apparent to anyone who has given the matter careful consideration that Deity cannot make complete explanations until the human mind has developed to the stage where it is capable of grasping the full truth. Who will dare to say at what time this will come short of human perfection? Just so long as human beings are imperfect, they will be unable to grasp the full meaning of eternal truth. The degree of completeness of explanations can be made only in proportion to the ability of the hearer to comprehend things as they really are. It is no indictment, therefore, against the validity of the Bible that its narrative should be couched in language which the mind of ancient Israel could understand, but, quite to the contrary, it adds another testimony to its divine authenticity.

Moreover, there is no adequate reason for

assuming, as many modern churchmen do, that Deity couches his explanations in myths and parables, the real meaning of which can be discerned only by the wisdom of professional theologians. Such an attitude would impugn to Him the qualifications of imperfection. On the other hand, when God reveals himself He makes his meaning clear to the extent of the ability of His hearers.

It follows, therefore, that the Bible narratives can be accepted for what they say, necessarily, of course, taking into consideration the limitations of the people to whom they were given. The writer does not believe, for instance, as one prominent churchman has said, that the scriptural account of creation is merely a parable given to teach the "glorious truth that the Lord God is one God". We cannot believe that Deity would go so far "around the bush" in teaching a simple truth, and that He would obscure it so completely within a mass of interesting fables that the intelligence of a modern scholar is required to discover it.

It is only within recent times that the Biblical account of creation has been widely interpreted to mean anything other than that which it plainly teaches—the origin of the earth and its inhabitants—and without doubt the people

to whom it was given placed a similar interpretation upon it. This being true, and if Deity did not mean what He said, the ancients did not understand Him and He failed in His efforts to deliver the message that He intended they should receive. And the failure has remained for these thousands of years until just now some modern scholar has discovered His meaning.

It is not reasonable to believe that Deity would so poorly present a message that thousands of years must elapse before its principal meaning was understood. His omniscience should enable Him to couch a message in such language that His principal hearers would not misunderstand Him, otherwise His efforts could properly be regarded as failures.

That the scriptures should necessarily be interpreted with strict literalness does not follow from this line of thought. If God were to deliver a message to us which He had formerly given to ancient Israel, He would probably present it in slightly different language, here and there amplifying and explaining where necessary, yet He *would not and could not repudiate His former assertions.*

The writer is not unwilling to believe that if Deity today were to retell the story of the origin of the earth, He might couch it in lan-

guage quite different from that contained in the Book of Genesis. Instead of using the term "create" He would probably substitute "organize" or "form", and He would replace the idea of "day" with another which involves long creative periods. Finally, He would doubtless make it even clearer that the laws of nature are the laws of God, that they are subject to Him and that He works through them.

The point is that the story that God would tell today would carry with it the plain, simple truth up to the ability of ourselves to comprehend. But it is not unreasonable to suppose that if it were retold to future generations it would likely need still further amplification. The story cannot be comprehended in all its details until man has reached the full perfection that Deity Himself has attained.

The story of the deluge has been selected as the subject for discussion in the following chapter. It is confidently hoped that the line of thought therein set forth will enable the student to obtain a viewpoint by means of which he can interpret still other phases of the sacred scripture that have been criticized by the disbeliever.

CHAPTER XVI

THE DELUGE

No phase of Bible history has been the object of stronger adverse criticism than the story of the deluge. Moreover, the effect of the criticism has been almost directly proportional to its severity. Indeed, at present there are few people who unreservedly accept the literal account of the flood; this applies almost as fully to the Christian as it does to the disbeliever. Even by those who claim to accept the narrative, it is often so highly distorted that the result is virtually equivalent to a denial.

This particular account became the subject of criticism among the earliest attacks upon the Bible. It was probably selected because it appears to be easily assailable at a number of points. The first attacks were made at a time when the Bible was rather generally regarded by Christians as more or less infallible. The enemy used wisdom, therefore, in selecting an account like that of the flood, for if he could show that this particular one is erroneous, then the whole field would immediately be open to him for further and easier progress.

No one will deny that the literal statements in the narrative are very sweeping and comprehensive. They tell of the preaching of the prophet, of the displeasure of God because of the sinfulness of the people, of the building of the ark in which the righteous might be saved, of the gathering together of animals in pairs from all quarters of the earth, of the continuous rain for forty days and forty nights, of the complete destruction of all life except that which was in the ark, of the voyage, and, finally, of the disappearance of the water. In addition to these generalities, the number and clarity of details make the narrative an unusually positive and straightforward one.

The story in its literal aspects, however, is generally thought to incorporate a number of weak points, for instance, the incident dealing with the gathering of a male and a female representative of all animals upon the earth. The task seems to be an impossible one. In the first place, the work would necessitate the sending of expeditions into the remotest quarters of the earth, not only into the particular land in which Noah was living but also into the distant islands and continents. It is hardly probable that this ancient prophet had any such resources at his disposal. But let it be supposed, for sake of argument, that by some means, unknown to

us, Noah and his associates may have been able to collect this vast concourse of beasts. The question next arises as to what he could have done with them? The ark was much too small to house and carry them. This at least is the argument of the critic, and its chief points do not seem to be entirely unreasonable.

Furthermore, with respect to the rain and the consequent submergence of the land, the narrative points out that at the close of forty days and forty nights the high points of the earth disappeared beneath the water. The critic reminds us, however, that the highest mountain peaks are nearly five miles above mean sea level and that to submerge them in forty days and forty nights, it would be necessary for twenty-five feet of rain to fall every hour, or about six hundred fifty feet per day, whereas the rate of precipitation of the most violent tropical storms of modern times is scarcely one tenth as great. Moreover, the critic continues, evidence is equally as damaging in the matter of the possible source of this tremendous volume of water. Science has determined somewhat definitely the thickness of the atmosphere and the percentage of water that it contains. The quantity thus available is much too small. Then, too, in the matter of the disappearance of the water, the critic insists that

if the suns rays were sufficiently strong even to boil the water, it could not have disappeared in anything like the time stated. He further points out that the water could never have reached these alarming temperatures, otherwise Noah and his associates would have perished.

Thus the argument runs. We will return to a consideration of its merits farther on. By its use the disbeliever thought that he was delivering a fatal blow to the validity of the deluge narrative and, therefore, to the Bible as a whole.

The immediate effect of this argument and of others of its kind was to shatter man's confidence in the Bible. Many people took the matter so seriously that they lost faith in the scriptures and turned infidel. Others modified their estimates of the Bible to such an extent that their former views were scarcely more than recognizable.

Churchmen at the present time, and more particularly preachers, widely look upon the story of the deluge as a bit of romance and mythology, introduced into the Bible for the purpose of teaching some hidden truth. Most of them give it no real historic background. To them the story in its literal form has no significance; it is thought to have been designed for the purpose of carrying some deep-seated message to the

mind of primitive Israel. As a result of this attitude, one is tempted to remark that these teachers of righteousness are impugning to Deity, perhaps unwittingly, a great deception.

The writer's views do not conform with the widespread belief that there is no real historical background for the Biblical story of the deluge, nor does he believe that a strictly literal interpretation of its statements is necessary to its acceptance. In the writer's judgment, theologians generally have been much too hasty in accepting the conclusions to which the arguments of materialists and other disbelievers have driven them. The chief object of the disbeliever in his attack upon the story of the deluge undoubtedly was to destroy faith in the Bible and consequently in God. The churchman saw no immediate escape from the critic's argument, and, therefore, in many cases he promptly surrendered. He may not have thought that he was acceding to the wishes of the disbeliever, but in the end the action was not far different. The average preacher of today will deny the historic value of the deluge almost as emphatically and as readily as will the disbeliever himself.

This attitude of ready concession to the demands of the disbeliever is more pronounced in recent years than it was formerly. Fifty years

ago the critic's argument was met by the greatest obstinacy. Whenever the preacher is wrong he should, of course, admit it and immediately set about to make the necessary readjustments, but the point is that in most cases he is much too ready to accept the atheist's estimate as to what science has proved.

The churchman should be exceedingly cautious in exchanging long accepted interpretations of the Bible for newly formulated ones, particularly when the new views challenge the truthfulness of prominent historical data. Otherwise the churchman may learn, much to his sorrow, that he has exchanged valuable theological explanations for supposedly scientific ones, which the scientist himself may soon modify or even repudiate. Of recent years the scientific world has sustained some severe shocks. Over-faith in our accomplishments had led us to believe that we, as scientists, had many things pretty well "nailed down", pretty well proved. We had come to regard many of our doctrines almost in the light of laws, rather than as theories or hypotheses. But of late, even the time-honored molecular theory has undergone serious revision, not to mention the fact that some of our "'laws" relating to gravitational attraction are just now the object of serious question.

The widespread tendency of civilization to worship at the shrine of newness has encouraged the abandonment of older ideas and their replacement by new, untried ones. Science itself furnishes numerous examples of return to doctrines formerly accepted but in the meantime abandoned. It is not improbable that science may yet compel the Christian to return to his discarded story of the deluge, not perhaps in the same form in which it was previously interpreted, but in a form that will give it a genuine historical exactness.

In fact, more than half a century ago the science of geology discovered that the earth has recently been visited by a period of pronounced flooding. Moreover, the period of flooding post-dated the appearance of man on the earth. as proved by the fact that his implements and also his remains are involved in the sediments of the time. While the date assigned to this period by the geologist is much more remote than the Biblical chronology appears to give to the deluge, yet the appearance of both of them subsequent to the origin of man is not without suggestive significance. Various efforts have been made to correlate the period of flooding shown in the geological record with the deluge as recorded in the Bible, usually, however, with but

little success, perhaps because of their actual dissimilarity and perhaps because of inability to recognize their identity.

Brief mention of the outstanding features of the period of flooding as revealed in geological history may assist the reader in properly estimating its relation to the deluge as recorded in the scriptures. Earth climates of the past have been far from uniform over long periods of time. On the other hand, they have oscillated from warmer to colder, and vice versa, a number of times throughout geological history. Immediately preceding the present, the climate was one of slightly greater cold and of higher precipitation. Vast sheets of perpetual snow and ice accumulated in the higher altitudes and higher latitudes. In America, practically all of Canada was covered by a continental glacier which reached over into the United States as far south as the Ohio-Missouri river system. The position of the margin was regulated largely by the velocity of ice movement, and by the rate of melting. Occasionally the margin would either advance or recede, depending upon the predominance of the one factor or the other. Contemporaneous with the ice sheet, Alpine glaciers were present in many of the canyons of our higher mountain ranges. In the northern

hemisphere they are known to have existed as far south as the San Francisco mountains of central Arizona.

The melting of these ice sheets greatly increased the quantity of water normally carried by the streams. Floods frequently became torrential. The combined action of the ice and the water caused many streams to over-run their banks and in some cases even to reverse their direction of flow.

Evidences of this flooding are present not only in the areas adjacent to the great ice sheet but also in various parts of the more mountainous country.

It would be interesting to know whether the period of flooding just referred to is equivalent to the deluge described in the Bible. The writer has no fixed opinion in the matter, but he sees nothing vitally objectionable to their being identical. In many respects the two accounts are totally unlike; one is written in the language and vision of an ancient Israelite and the other in the language of nature. No scientist, of course, would argue that the geological record furnishes evidence to establish the details of the Bible narrative. Moreover, the geological record reveals no recognizable evidence of com-

plete submergence, nor even of universal flooding.

On the other hand, the geological record provides indubitable evidence of marked flooding after the appearance of man on the earth, not universal nor sufficiently intense to inundate mountains, but violent enough to be highly destructive.

Another aspect of the subject, quite aside from any relation to the geological record, seems to offer a satisfactory explanation of the Biblical narrative. At the time of the deluge, the people of Noah still remained largely in isolated groups. They banded themselves together into comparatively small units and knew but little of other people or of the surrounding country. Even local geography must have been but poorly known. Means of communication were primitive and, in consequence, their information was limited largely to things immediately about them. Any destruction, therefore, that befell their particular locality might properly be regarded by them as befalling the entire earth. Under such conditions it would be unreasonable to expect that the ancient chronologer could describe countries and peoples other than those with which he was acquainted; on the other

hand, his accounts would necessarily be limited to the land of his acquaintance.

If he should witness a flood rising to the summit of the highest hills in the immediate country with which he was familiar, he would naturally speak of the *whole country* as being submerged. Moreover, if he gathered together all of the animals that he had seen, even though the group was limited to domestic animals such as horses, cows, dogs, and cats, we should expect him to refer to them as *all* animals. Finally, if he was not acquainted beyond the limits of his own people, and if all of them were drowned, he would speak of *all* the people of the earth as having been destroyed.

The writer is making no effort to beg the question; quite to the contrary, he is trying to go directly to the heart of it. Students of the Bible are not justified in interpreting the narrative of this ancient Israelite in terms of modern civilization. Conditions are far different at present from what they were in the days of Noah. Means of communication are such today that when an important event occurs in the remotest part of the earth the world may be apprised of it in the course of a few minutes or hours. If a windstorm sweeps over the western plains or an earthquake occurs in the Orient, the world is

informed almost before the disaster has abated. If the scientist discovers a new animal or even a new spider in Australia or Africa, we may familiarize ourselves with it almost as soon as we choose.

On the other hand, primitive Israel had no really effective means of communication except by personal carriers. Even then, events of the greatest importance might take place almost at their doors and yet they would never hear of them. They were likely no better acquainted with the outside world than were the isolated American Indian tribes at the time of the coming of Columbus. Yet somehow Bible critics feel justified in interpreting the account of the flood in terms of modern civilization, when, as a matter of fact, there is scarcely a single thing in common. We might with equal reason insist upon interpreting Indian battles in terms of modern world warfare.

The writer can easily imagine these primitive people as living in a fertile valley adjacent to the course of a quiet, meandering stream. He can see their crudely tilled farms scattered along the valley floor and their small herds of cattle grazing on the near-by hills. It is believed by some investigators that these people were largely oblivious to the existence of any one else in the

world, and that their geographic knowledge was more or less limited to the area determined by the horizon of the rolling hills about them.

The writer can think of these people as becoming sinful, and of God's resulting displeasure. He can imagine Noah going from house to house and warning the inhabitants of the impending doom that God had revealed to him. He can imagine the preparation that the prophet had been instructed to make—the building of the ark and the gathering of the animals.

The writer can also picture the manner in which God may have brought about his purposes. In order to supply an illustration, one needs to go only to an ordinary valley and witness the conditions due to stream flooding. Almost monthly our newspapers print accounts of towns and villages having been invaded by high waters incident to so-called cloud bursts or to rapidly melting snows.

Following the floods, the writer can think of the ark as drifting down the swollen stream and perhaps out into the ocean. He can also think of the long days of waiting and the final landing. (Bible students will recall that the narrative is indefinite as to the precise country in which Noah and his associates lived in ante-diluvian times.)

The writer can readily understand how that under these simple conditions the Biblical account of the flood could have been written. The interpretation suggested above is, of course, hypothetical, but it does not detract from the dignity of the account; rather it heightens it, since it shows how simply and how literally God could bring about His purposes.

Human beings have always been prone to think of Deity as operating in a mysterious and spectacular manner. When Naaman, the Syrian captain, came to Elisha to be healed of his leprosy, he went away in wroth because the prophet had given him the simple task of bathing in the River Jordan. The Syrian admitted that he expected the Prophet to "call on the name of the Lord his God, and strike his hand over the place, and recover the leper". Naaman's servant remonstrated with him that if he had been told to do some great thing he would have responded, and concluded with the argument that it is much better to obey simple instructions and receive the blessing.

No one, of course, is familiar with the precise conditions under which Noah and his associates were saved and the others were destroyed. Whether it was due to the somewhat general flooding occasioned by the Glacial per-

iod or to some more local condition, such as a swollen river, we have no accurate means of knowing. Of one thing we are certain, however, and that is even though there may be considerable evidence against a literal interpretation of the Biblical narrative, we are not justified, because of this, in abandoning it and in claiming that it has no place in history.

CHAPTER XVII

IS THE MIND OF MAN ETERNAL?*

Perhaps no thoughtful person has ever stood at the bier of a departed friend without some question arising in his mind as to whether the spirit or intelligence of the friend had not actually ceased to exist. Is the mind of man destroyed in death or does it live on forever? No question has been discussed more widely and perhaps none is of greater importance. Natural man of himself knows little or nothing concerning his future existence. Of the untold millions of human beings, who at various times have inhabited the earth, an exceedingly small number has been permitted to return. From a purely human point of view, when men die they are never heard from again. The universality of death and the absence of communication between the living and the dead have caused even believers to speak of the hereafter as the "great unknown".

If it were not for the goodness of Deity we should know nothing of life after the grave.

*The term mind is used in this chapter as the sum total of man's consciousness as contrasted with his body.

Because of His graciousness, however, He has revealed to His servants, the prophets, that death is not the end of man's existence, and that the nature of his future happiness will be determined largely by his earthly deeds. In a measurable degree, even the details of the hereafter have been made known. Deity commonly chooses certain righteous men to act as his spokesmen. It is reported, however, that on unusually important occasions the Lord himself and His Son have delivered messages in person.

It is not from this point of view, however, that the present chapter is written. We desire to leave the question of revelation aside and approach the problem wholly from another point of view. In order to simplify the task, it will be necessary to direct attention to a consideration of certain scientific principles.

A few generations ago it was widely believed that matter could be destroyed practically at will. The burning of fuel on the hearth was cited as an illustration of the complete annihilation of materials by means of combustion; its disappearance before the eyes of the observer was regarded as ample proof of this contention. The conclusion, of course, was highly erroneous and was reached only because the workings of nature were not understood.

Similarly, it was also believed that certain substances were spontaneously generated from a state of nothingness; the sudden appearance of mushrooms or of maggots in a decaying medium was regarded as proof of this phenomenon. Lack of acquaintance with the laws of nature was, of course, responsible for such a conclusion. It is now accepted as a fundamental truth in science that nature neither creates nor destroys matter. Matter is eternal.

Criticism of this former-day attitude should not be too hasty. Many years of faithful work have been required on the part of scientists to show that matter can be neither destroyed nor created. In fact, it is doubtful that even today more than one person out of ten can satisfactorily explain the destiny of, say, a piece of coal on the hearth. It is no wonder, therefore, that when our forefathers witnessed the burning of fuel or the rotting of wood, they believed that these materials were being annihilated.

Science has definitely shown, however, that such is not the case. The burning of wood consists essentially of chemical changes. The carbon, comprising the principal part of the woody tissue, exists just as really after burning as before. Upon uniting with the oxygen of the air, it becomes invisible to human eyes, but not an

infinitely small part of it is destroyed; its physical form only is changed.

Science has learned how to detect the presence of these invisible gases, and even how to measure and to weigh their amounts. An experiment, familiar to practically every student of science, has been arranged to demonstrate this matter. First the weight of a candle is accurately determined by means of an exceedingly delicate balance; it is then lighted and placed in a simple apparatus designed to entrap the various substances that arise from its combustion. After the candle has been completely burned, the materials that have collected in the apparatus are carefully weighed, and, if the experiment has been accurately performed, it can be shown that not a particle of the material formerly comprising the candle has been destroyed.

What has been said of the indestructibility of the material comprising the candle is similarly true of every other form in which matter is known. Water may evaporate, iron may rust, vegetables may decay, and houses may burn, but the materials of which they were composed go on forever.

The manner in which the elements may appear and reappear in similar forms is interesting. Coal consists principally of carbon, or charcoal.

Upon burning, it unites with oxygen from the air and forms carbon dioxide, an invisible gas, which passes out into the air and is assimilated by it. The earth's atmosphere is composed principally of nitrogen, oxygen, water vapor, and carbon dioxide. Under favorable conditions the sun's rays react upon the latter substance in such a manner as to make it available for plant growth. Later the oxygen passes off into the air and the carbon reappears in the form of woody tissue available again as fuel.

It is an accepted dictum among scientists that nature destroys nothing, no matter how small or apparently insignificant. Matter may be changed in form, either chemically or physically, as charcoal into carbon dioxide or as iron from the solid to the liquid state. Fundamental to all these reactions, however, the ultimate particles, whatever they may be, atoms, electrons, or even more minute bodies, remain unchanged and forever indestructible.

Moreover, most of what has been said concerning matter is similarly true of the energy that may accompany it. The potential energy possessed by water at the brink of a fall is transformed into kinetic energy during its downward passage. This in turn is changed into mechanical energy as it drives the turbines, this into elec-

trical energy through the employment of dynamos, and this, at the will of the operator, into light, or heat, or almost any other form that may be desired. During all these transformations not the minutest fraction of energy is destroyed.

Nature is so zealous in the matter of conservation that even the energy accompanying the falling of a leaf or the chirping of a bird is not lost. A man standing in the midst of Sahara might whisper so faintly that his voice would not be audible a foot away, yet the energy so expended continues to exist forever. Not even the energy utilized in the movement of a tiny fish in the depths of the ocean is destroyed or annihilated. The energy thus expended may be changed in form but it is never lost. Nature loses nothing; matter and energy are eternal.

Now with reference to the human mind. While it is true that the human mind cannot be weighed in balances or be found by the surgeon's knife, neither can it be detected by the heat of the white-hot crucible, yet no one will deny its existence. Wherever man goes the presence of his mind is plainly manifest.

While the writer is preparing this article he is far removed from the busy centers of civilization. At the door of his cabin stands an auto-

mobile that last night brought him overland from a point on a great trans-continental railroad. Less than forty-eight hours ago he was at his own fireside several hundred miles away. Entirely of his own accord he decided that the trip should be made, and his present whereabouts is wholly the results of that decision.

It would have been impossible for the writer to have traveled this long distance in so short a time without the aid of railroads, automobiles, and other mechanical devices. Yet behind all these mechanisms is the mind of man. Long ago human decision brought the minerals from the mines and the timber from the forest and later fashioned them into machines designed for the transportation of man. Without that decision the various materials would have remained in their native state time without end. That the mind of man is superior to the iron, the wood, and the fuel no one will deny. The machines which they compose are the product of man's brain.

What has been said of the locomotive and its intricate equipment applies with equal force to the automobile at the door of the writer's cabin. Not only the present machine but the various devices of which it is composed are the result of man's ingenuity. First of all the machine was

conceived by the mind of man, and then the iron, the wood, the rubber, the paint, and the fuel were assembled into a working whole, all subject and obedient to him.

Yet when the automobile is separated from the influence of man's intellect, this wonderful machine instantly becomes an immovable thing. The one now standing at the door of the writer's cabin, if untouched by the mind of man, would remain there until the decay of time finally crumbled it into the earth from which it came. But at the will of intelligent man, it readily becomes almost a vitalized, animate thing capable of carrying him wherever he desires to go. It is the product and servant of man's will.

Yet, on the other hand, if the reader could go to this machine and break off a piece of wood or steel, pound it into impalpable powder, select the smallest fragment with the aid of a high power microscope, grind the fragment through all time to come, and otherwise subject it to the fury of the ages, if he could do all this, still he would find himself totally unable to destroy the minutest fraction of it. No, nature destroys nothing.

What, then, can be said of the human mind? Shall it die and come to naught when the vastly

inferior things over which it is master continue on forever?

From the scientific point of view, belief in the future existence of man needs no defender. If the dictum of science is true in relation to the conservation of energy and the indestructibility of matter, the atheist and the disbeliever should be called upon to explain why nature should make an exception and destroy man when she insists upon matter and energy existing forever. Destruction of the human mind would constitute an exception to the economy of nature. It may be replied that the human mind is neither matter nor energy. Yet, on the other hand, the mind of man is superior to either or to both of them. It cannot be argued with propriety that nature will annihilate the greatest thing in the universe and permit, nay, compel, the subordinate ones to continue on throughout the endless eternities of all future time.

CHAPTER XVIII

LITERAL RESURRECTION OF THE HUMAN BODY

Resurrection of the human body is a scriptural doctrine in which nearly all Christian people believe. There exists, however, a wide variation of opinions concerning the literalness of its meaning. Some of the interpretations are so vague and indefinite that they contain practically no aspect of reality, while others demand a complete and unimaginative restoration of the body to the spirit. According to the latter view, life after the grave differs from that before death principally in purity of mind and of body, rather than in change of form or of function. Churchmen of this conviction believe that in the resurrection the graves will be opened and the body and the spirit will unite as before. The body, of course, will be renewed and purified and no longer subject to the pains of mortality and to death. It is taught that resurrected man will not differ in form of body from mortal man; in a word, it is believed that the resurrection will be a very literal one, that the body and

the spirit in their present forms will unite and continue in such a state for all time to come.

Some churchmen have insisted that even the identical elements or materials composing the body at the time of death will be reunited with the spirit in the resurrection. Within recent years, however, this extremely literal interpretation has encountered much opposition. Students of science have found, or think that they have found, damaging evidence against such an interpretation, as a result of which large numbers of people have abandoned belief in a resurrection of the human body in any form. At least the controversy has given rise to some very indefinite opinions concerning the condition of man's future estate.

In order to explain the nature of the discussion and the arguments employed, it will be necessary to review certain matters relative to the chemical composition of the human body. In various laboratories human bodies have been subjected to careful chemical analysis, and their composition has been accurately determined, both with respect to the kind of material involved and to the quantity present. Much to the surprise of many people who are not technically trained, it has been shown that the human body consists of some of the commonest known

substances. Water and carbon make up by far the greater part of it. The following analysis shows the composition in some detail:

It is interesting to note that of a human body weighing, say, 125 pounds, approximately 100 pounds are water, 15 pounds are carbon, and the remaining 10 pounds consist of nitrogen, phosphorus, chlorine, flourine, silicon, iron, magnesium, iodine, etc. When viewed in the light of this analysis, it is apparent that the human body is composed literally of the dust (elements) of the field.

The analyses, however, reveal nothing more than should be expected. It is well known that the human embryo increases in size because of the food eaten by the mother, and that after birth the individual grows by means of the food ingested by its own system. Inasmuch as all food comes from the elements of the field, it is apparent that the human body, at least from a chemical viewpoint, must be of very ordinary composition.

This brief and admittedly incomplete statement should not be interpreted as a disparagement of the most highly developed organism ever created by Deity—the human body. We are not speaking of structure or of function but rather of composition. The anatomist's knife

has revealed wonders in matters of design and adaptation, but the chemist's reagents have shown none but the most ordinary elements. One is deeply impressed in this connection to observe that the Creator can make a mechanism so complicated and so perfect from material so commonplace.

Immediately after death, decomposition attacks the human body and later completely destroys it. The flesh disappears first and finally even the hardest parts of the skeleton are decomposed. Decay of the softer parts is so rapid that under normal summer temperatures the body becomes repulsive to look upon a few days after death.

Herein lies one of the crucial questions of the present discussion. What becomes of the flesh and bone after decomposition? Under ordinary conditions of burial, the water composing the greater part of the body finds its way through the casket and out into the surrounding earth. When a body is placed in a hermetically sealed container the process is only postponed, since sooner or later the container itself undergoes decomposition and the water is free to escape. Thereafter the water either makes its way directly to the surface, or, what is more likely, it mingles with the underground supply and passes

on through the interstices of the soil. Eventually all of the water will become a part of the earth's hydrosphere and perform the various functions of ordinary water. What has been said of the water applies in general to the carbon, the iron, the phosphorus, and the other elements comprising the human body at the time of death. In this connection a simple meaning is given to the statement that "dust thou art and to dust thou shalt return."

Again the vital question might be asked: What becomes of the elements as they leave the decaying body and go back to the common storehouse from which they were originally derived? Does their individual identity, in the sense that they once formed part of a particular human body, become lost? Is it possible that in the course of time they may again become part of some other living organism? If this is the case, is it probable that these same particles of water, carbon, iron, etc., may go through this cycle again and again, forming throughout eternity a long chain of plant and animal organisms? Science seems to have answered each of these questions with a positive affirmation.

Herein lies the principal argument of those who do not believe in a literal resurrection of the human body. They contend that if the ele-

ments that compose the body are assimilated by nature's great supply of similar elements, and are subsequently used in the making of other organisms, a literal resurrection of the body is an impossibility, since identical elements cannot form parts of different bodies at the same time.

Upon first consideration this conclusion has the appearance of being well founded. It would be difficult to find anyone well trained in scientific matters who would deny the probability that material now comprising human bodies may not at some future time enter into the composition of still other bodies, even those of human beings. Moreover, no one will argue that the same matter can be present in more than one place at a time. Hence it seems probable that the identical elements now comprising a human body may never be able to return to it in the resurrection.

The danger of the conclusion does not exist in its immediate significance but rather in the broad application to which most of its adherents carry it. After once having become convinced that a literal return of the elements to the body is highly improbable, the step to belief in no physical resurrection at all is easily taken. Even ministers and others well versed in theological matters have conceded that this line of

evidence seems to prove that the human body cannot be restored to the spirit after death. The conclusion naturally follows, to those who take this stand, that the resurrection is figurative rather than real.

On the other hand, many of those who believe in a literal resurrection of the body have felt themselves called upon to oppose and even to disparage this argument from science. Usually in a very unsuccessful manner, they have tried to make it appear that the particular elements composing a body are essentially limited to that body, and that it is somehow impossible for them to become parts of other bodies. It is not likely, however, that such an argument and conclusion can be substantiated by fact.

But, strangely, for some unaccountable reason, it seems to have been assumed by both parties to the controversy that restoration of the identical flesh and bone is necessary in a literal resurrection of the body. It has been widely conceded that if the same flesh and the same bone were not restored, it would not be the same body. If the believer in a literal resurrection takes this stand he will likely have trouble in substantiating his convictions.

But does a literal resurrection of the body demand the reappearance of the identical flesh

and bone composing it at the time of death, or is it true that a literal resurrection of the body is not a question of the literal return of the elements that compose it? The question must not be begged but must be fairly and frankly met. In order to answer these questions it will be advisable next to consider certain aspects of the science of physiology and nutrition.

The human body is composed of an almost infinite number of cells, each one of which is a unit in itself. The material of these cell structures is continuously undergoing catabolism or disintegration. Every movement of the body, no matter how slight, and whether voluntary or involuntary, is accompanied by this action. It is primarily because of this ever-present destruction that the body becomes weakened and makes regular demands for food. One of the chief functions of both the respiratory and the excretory systems is to carry away the broken down materials arising from catabolism within the cells.

The human body with its intricate cell structure may be crudely compared with a building made up of an almost infinite number of bricks. If we think of large numbers of these bricks as continuously undergoing disintegration, we have

a fair illustration of the manner in which destruction is going on within the human body.

Furthermore, if these broken down bricks are not repaired, the stability of the house will soon be reduced. Precisely the same thing is true of the body and its component parts. One of the chief functions of the food that we eat is the rehabilitating of worn out cells. If, in the case of the building, we can imagine some agent going from place to place continuously repairing the weakened bricks, we have before us a process comparable to that accomplished by the blood with its load of food, really its building material. Disintegration and integration within the cell structures continue throughout the entire lifetime of the individual and cease only at death.

When this process of destruction and reconstruction continues long enough the entire human body will be composed of new material. Physiologists are not agreed concerning the length of time necessary to bring about a complete replacement, but, whatever the length of time may be, it is apparent that when the period is completed, the body has actually changed its physical personality. For, if it is argued that specific and identical flesh and bone are necessary to the existence of any human body, it

naturally follows that the individual in question has experienced a change of identity.

The substitution of new material for old, however, is so slow and so gradual that if it were not for the technical methods of the scientist, little would be known of its existence. To the unaided eye the change is wholly invisible. The process goes on so imperceptibly that in no phase of social or other human activity is it ever recognized. Otherwise a husband might divorce his wife at the close of the period of complete physical replacement, on the ground that the woman whom he had previously married had actually ceased to exist. At the close of a similar period, a mother might refuse to recognize her children because they were not the ones to whom she had given birth. Similarly, the court might dismiss all criminals, and, finally, in course of sufficient time, all relationships and all obligations between individuals would become null, since the contracting parties had been replaced by others.

No! it is not particular flesh and bone that characterize individuals. There is something about the human body far more distinctive than so many pounds of flesh and bone and blood. There is a physical personality in every human being that stands out infinitely above the con-

stituent elements. There is an identical something that characterizes human beings from infancy to old age. The human body may increase in size, it may grow thin, or it may become stout, yet it never loses its identity. The man who adds, say, fifty pounds to his weight is never regarded as even partially another person.

We may admire a beautiful house, but our admiration is not centered in the grains of sand, the nails, or the particles of wood and paint that compose it. It is the ensemble or personality of the house that pleases us.

Similarly, we could easily gather together the requisite quantities of water, carbon, etc., that comprise the human body. Nay, we could do more; we could assemble the *identical elements* that formerly composed the body of a friend, yet this crude heap would be far different from the friend in lifetime.

We do not admire our loved ones because of the particular oxygen, hydrogen, iodine, etc., of which they are composed. Human beings are more than mere chemical compounds.

The crucial question in this connection is whether there is any real reason that individuals in the resurrection may not retain their

identity and at the same time be composed of entirely different elements than during the earthly existence? This would be nothing more than had occurred before death. *If an individual during his earthly existence experiences a change of his bodily materials, and yet remains the same being, does it not follow that a similar thing may occur in the resurrection?*

Belief in a literal resurrection of the human body is, therefore, in no way weakened by the argument that the particular elements comprising the body at the time of death may not be restored in the resurrection. Moreover, the possibility or even the likelihood that the identical elements now composing human beings may later be utilized by other bodies does not constitute a refutation of belief in future bodily existence.

On the other hand, the fact that nature, under the supervision of Deity, has assembled the commonest elements and fashioned them into living, human beings is at least suggestive of her ability to perform a similar work in the resurrection. In all probability the resurrected body will not be produced in the same manner that earthly bodies are made, neither will it be composed of all of the elements formerly present in

the mortal body, otherwise it would be subject to pain and death, as at present. Finally, there will be nothing more miraculous in the making of resurrected bodies than there is in the making of earthly bodies.

CHAPTER XIX

THE TWO ACCOUNTS OF THE CREATION

The accounts of creation, as contained in the geological record and the Book of Genesis, are regarded by some people as largely incompatible. Among those who view the matter in this light are both churchmen and disbelievers. The reasons for this attitude, however, appear to be largely due to lack of familiarity with the records themselves rather than to actual disparities that have been discovered within them. The writer has been led to believe, on the other hand, that the two accounts exhibit not only a remarkable absence of disharmony, but the presence of a striking agreement wherever the records touch on similar ground. The chief purpose of the present chapter is to outline the essential features of the two accounts and to discover whatever similarities and dissimilarities that may exist.

At the outset, however, it must be understood that the two records cannot be interpreted from the same point of view. The one is a theological narrative designed to meet the needs

of a primitive people and the other is a story written in the rocks and explained in terms of twentieth century understanding. The Biblical narrative contains scarcely more than 500 words, and, therefore, it necessarily deals only with outstanding generalities. The geological record, on the other hand, describes not only the salient features of earth history but it recounts in detail literally millions of incidents not even hinted at in the other record. The Biblical account occupies the space of less than a full printed page, while the geological record, as thus far interpreted, fills enough books to make a large public library. The Book of Genesis stresses the fact that God is the creator, while the geological record confines itself chiefly to the manner in which the creation was brought about. One of the accounts was written to impress ancient Israel that God is the creator of the earth; the other is a detailed recital of how the work was accomplished.

Opponents of the Biblical narrative sometimes assert that the story as told in Genesis was borrowed almost verbatum from people much more ancient than the Israelites themselves. Seemingly, the purpose of the objection is to question the validity of the account on the ground that it was not received through direct

revelation from God. The conclusion, of course, is unwarranted, because even if the story were borrowed in its entirety, such an origin would not militate against its validity. Many important truths have been transmitted from one people to another. It is no more illogical to believe that God may have revealed the story to the ancients, from whom it was borrowed by the Israelites, than it is to believe that the narrative was originally given to the Israelites and later transferred to us.

The outstanding features of the two records of creation will be discussed in the present chapter under the following headings:

By Whom Created.
Manner of Creation.
Time Involved in Creation.
Order of Creation.

By Whom Created. The Biblical account makes the simple statement that "God created the heaven and the earth". From this point of view there can be no question concerning the identity of the Creator. The geological record, on the other hand, furnishes no direct statement that Deity is the creator of the earth or whether or not there is a creator. The record concerns itself primarily with a description of the events

as they took place and the manner in which they were brought about. The silence of the geological record concerning the existence of a creator offers no justification, however, for the interpretation that the earth made itself. If such an attitude were warranted, it could be argued with equal reason, for example, that every house not bearing the name plate of the architect and builder came into existence of its own accord. One the contrary, both the houses and the earth offer unmistakable evidence of the existence of an intelligent maker.

Manner of Creation. The Biblical narrative is exceedingly brief; its details furnish no clue of the manner in which Deity wrought his purposes. The inference is warranted, however, that whenever God spoke, His commands were obeyed. The statement "Let there be light; and there was light" is suggestive of this conclusion. Moreover, the record leaves no room for doubt that Deity was master of the situation and that the results were in harmony with His will.

The geological record, on the other hand, is replete with illustrations of the manner in which the earth reached its present state of existence. According to the most widely accepted hypothesis of earth origin, the material now comprising the planet on which we live is believed to have

been brought together from a pre-existing, fragmentary state, probably derived from disrupted spheroidal masses. The processes of accretion were orderly and in strict conformity with the laws of nature. Nothing occurred fortuitously, or as the result of chance. During its early stages of growth, the earth was without an atmosphere or a hydrosphere—air or water. Gradually, however, these two indispensable components were systematically added. Widespread up and down movements of the earth's crust changed the geography in such a manner that parts of the sea bottom were slowly transformed into land masses. At a later time the destructive action of frost, rain, and wind finally converted a part of the rock surface into soil. Next came the appearance of primitive life, first, presumably, plants, followed by animals. Later these primitive plants and animals were replaced by more and more advanced ones, each of which left the record of its existence in the sediments of its time.

The geological record comprises two long lines of growth; one relates to the physical earth and the other to animals and plants. Each line shows an almost endless series of progressive events and each bears unmistakable evidence of evolutionary development.

Earth history, therefore, reveals the story of an orderly progressive creation. It begins with an almost endless amount of poorly specialized material, and from this unseemly mass it traces the development of the earth, together with its animal and plant life, up to their present state of existence. Briefly, earth history reveals the story of the greatest miracle Deity has ever wrought—the creation of a highly specialized world out of a mass of vastly simpler materials.

Certain interpretations of the Biblical account have pictured Deity in the role of Master Potter actually molding the earth into form with His own hands. Adherents of this view sometimes insist that God made the earth out of a condition of nothingness. Such opinions are, of course, wholly imaginative and without foundation in record. It is far more reasonable to believe that Deity's creative ability is due to His mastery of the laws of nature, and therefore, that by means of His super-intelligence He directed the forces of natural law and thus brought the earth into existence.

Time Involved in Creation. The scriptural account says that "In the *beginning* God created the heaven and the earth".* The term "begin-

*The italics are mine.

ning" is evidently used with reference to the history of the earth itself, since time is eternal, and, therefore, it is without beginning. Numerous efforts have been made by students of the Bible to determine the date at which God thus began His work. The usual practice of calculating from the present back to Adam and then adding the six "days" involved in the creative period has somewhat uniformly pointed to a date close to 4000 B. C.

The accuracy of this procedure, however, is subject to serious question. In the first place, it is exceedingly doubtful that a reliable chronology, extending uninterruptedly from the appearance of man down to the present, is available. The chronological data that appear among the marginal references of the Bible are the result of an effort on the part of a certain English scholar to establish such information; no one, of course, seriously considers that he has really succeeded.

In the second place, the practice of interpreting the term "day" to mean a period of twenty-four hours, seems to be without justification. The term as originally employed was doubtless intended to cover a long period of time. This thought seems to be borne out by a statement in the Book of Genesis itself (Gen. 2:4) where

the word "day" is used to include the entire six creative periods.

The geological record, on the other hand, furnishes indisputable evidence that the earth has been in process of formation for eons of time almost incalculably long. The problem has been approached by scientists from a variety of angles; the results somewhat uniformly indicate a period of at least one hundred million years. While, of course, no one accepts this figure as exact, yet it is serviceable in conveying the impression of an exceedingly long period of time.

Within recent years a rather ingenuous argument has been used against this conclusion. The only justification for mentioning it here, however, is the fact that it has been widely employed among laymen who are not generally prepared to meet it. Its adherents point out that inasmuch as the earth is probably constructed of the fragments of pre-existing heavenly bodies, it is probable that a considerable part of the history commonly ascribed to the earth actually belongs to these ancestral planets, and, moreover, that many of the fossils contained within the rocks of the earth's crust are the remains of creatures that lived and died upon the planet or planets from which the earth was derived. The answer is, of course, that even though the earth

may have been originally composed of fragmental materials, yet the manner in which they were brought together and subsequently assimilated has caused every trace of their original identity to disappear. The argument is never used by those who are familiar with geological data.

The persistent efforts that have been made by many churchmen to prove that Deity created the earth within the last few thousand years are difficult to understand, especially in view of the fact that these same people describe God as being eternal, without beginning or end. Out of the vast eons of time through which He has lived it scarcely seems reasonable that He should have made the earth only yesterday. The real glory of God is much more fully portrayed in a history that recounts the intimate operation of literally millions of factors over periods of time almost infinitely long.

Order of Creation. The order of creative events is plainly outlined in the Book of Genesis, also in the geological record. The marked similarity of these two chronologies is worthy of note. The Biblical account sets forth the work of each "day" as follows:

(1) Appearance of light; (2) segregation of waters in the firmament; (3) segregation of

land and water, appearance of plant life; (4) appearance of sun, moon, and stars; (5) appearance of water-living animals and birds; (6) appearance of land-living animals and man.

Examination of the following brief summary of earth history will show that the geological chronology, in its principal aspects, is almost identical with the one just given.

All of the principal hypotheses of earth origin point to the fact that the first act of nature in creating the earth was the rapid movement of materials, and the consequent appearance of light.

The hypotheses also assert that the incoming of the "earth stuff" tended to clarify the atmosphere, and, therefore, to draw a line of demarcation between the planet and the space around it.

It is further believed that at about the time the earth reached its full growth, water covered the greater part of its surface. This was followed by the emergence of the continents.

The exact time at which plant life made its appearance is not known, but inasmuch as animals cannot live without plant food, it is confidently inferred that plants were created first.

Theories of earth origin also agree that even when the planet had attained considerable size,

it was still hot enough to vaporize large quantities of water and thus to surround itself by vaporous clouds, which, at least in part, shut out the direct rays of the sun. Just when this haze finally cleared away, and thus permitted the suns rays to pass through unimpeded, is, of course, not known, but its disappearance is thought to have been largely completed before plants, and particularly animals, could have properly developed.

Water living creatures next became abundant, as attested first by the invertebrates of the Paleozoic and later by the amphibians and reptiles of the Mesozoic. Students of geology will also recall that true birds made their first appearance in connection with the reptiles.

Next, in point of age, followed the Cenozoic with its unparalleled array of land living forms, chiefly mammals. Then, finally, as the closing act of creation, man made his appearance.

The following tabulation will assist the reader in determining at a glance the similarities and the dissimilarities of the outstanding features of the two accounts of creation. Some of the early phases of earth history have not been definitely determined, especially with respect to their chronological position, and in such cases a question mark is used to indicate the uncertainty.

BIBLICAL RECORD	GEOLOGICAL RECORD
BY WHOM CREATED	
Created by Deity	No definite statement regarding a creator
MANNER OF CREATION	
No evidence of how creation was accomplished	Full details given
TIME INVOLVED IN CREATION	
Six days, but meaning of the term "day" is very obscure	Many millions of years
ORDER OF CREATION	
Appearance of light	Appearance of light
Segregation of waters above and below the firmament.	Clarifying of atmosphere by accretion of particles
Segregation of land and water	Appearance of continents?
Appearance of plant life	Appearance of plant life?
Appearance of sun, moon, and stars	Sun, moon, and stars first observable from the earth.
Appearance of water-living creatures, also birds	Appearance of water-living creatures, also birds
Appearance of land-living creatures	Appearance of land-living creatures
Appearance of Man	Appearance of Man

Comparison of these two great chronologies reveals no disagreement on points of major importance. On the other hand, the parallelism is remarkably close, especially in view of the fact

that one of the accounts was written by an Israelitic prophet several thousand years ago, and the other has been worked out by the combined efforts of modern scientists.

It is, of course, impossible, to draw sharp lines of comparison between two records that were made from such widely divergent viewpoints. They were not written for the same purpose nor in the same language. One of them stresses the fact that God is the creator of the universe and the other emphasizes the manner in which the work was accomplished, yet in different languages and with different intents they unite in telling the same story of the Master Builder and His product.

CHAPTER XX

SUMMARY AND CONCLUSION

The writer is aware that the material contained in the foregoing chapters very incompletely outlines the almost endless variety of subjects involved in the discussion between the atheist and the theologian. The object of writing this book, however, has not been to cover all of the materials drawn into the controversy, but rather to clarify a few of the salient points and thereby to reach some general conclusions as a working basis for the future. It has been the writer's observation that when young people are successful in obtaining the proper viewpoint in this matter, they can go on unaided and solve further problems for themselves.

One of the outstanding mistakes that have contributed to the misunderstanding between the theologian and the disbeliever is that churchmen generally have failed to understand the true relationship of their religion to other laws of the universe. The attitude of churchmen in concluding that religion is something separate and different from nature has given rise to the erroneous notion that part

of the universe is governed by natural law and part by supernatural law. This, of course, is all wrong. God is the creator of the heavens and the earth. His power is equally manifest in the flying of the sparrow and the healing of the leper. Doubtless there are greater laws and lesser laws with which Deity works, but everything in existence, no matter how mighty or how insignificant, is governed by Him and through Him. Universal law cannot be segregated into two classes, one over which Deity has control and one operated by nature.

It is difficult to understand how that Deity can be the Creator of the universe and yet independently operate only a part of that which He Himself has created. The idea is disparaging both to religion and to the Author of its existence, since it limits the scope of religion itself and confines the omnipotence of Deity to a mere fraction of the universe.

If God is the author and ruler of everything in existence; if He is all-powerful and all-knowing, it follows as a corollary that everything in the universe is operated and governed by laws subject to Him. The truth is that religion is not only as broad as the everlasting hills, but that it is as broad as eternity itself. Proper conception of religion should enable the believer

to accept truth no matter where it may be found. Whether it comes from the voice of God Himself or from the white heat of the assayer's crucible, it must be accepted as a part of the great system of universal truth.

Because of his distorted notion of God's domain, the believer was formerly able to accept only a part of the truth that came to him, and he was, therefore, forced to oppose everything that did not seem to agree with his restricted vision of the gospel. With the acceptance of the more reasonable interpretation, however, the believer should recognize all truth as a beautifully correlated system of laws, all working together for the salvation and eternal advancement of mankind. While, of course, it cannot be denied that some of the truths are much more vital and more important than others, yet none is so insignificant as to warrant its disregard or non-acceptance.

The obligations of the believer to find out and to accept truth constitutes his paramount duty. When properly understood, the Gospel of Jesus Christ creates within him an eagerness for knowing things, since he realizes that he is actually "saved no faster than he gains knowledge". Moreover, this high regard for truth causes him to be somewhat slow in accepting

new theories and new doctrines before their standing has been demonstrated. The segregation of truth from error is to him a matter of no small importance; truth ever leads upward toward success and safety, while error detracts and destroys. The believer, therefore, should be vigilantly eager for truth, but rightfully cautious in accepting, more than provisionally, new and untried theories. Furthermore, he should be very slow to condemn doctrines about which he has insufficient information.

Thus, in his search for truth, the Christian who properly understands the relationship of Deity to the universe is prepared to go forward into every field of human endeavor. He fears nothing because he knows that every truth articulates perfectly in the great scheme of salvation. He realizes that he must guard against making the mistake, so commonly made in the past, of accepting the disbeliever's interpretation of what science has proved. He must familiarize himself with the findings of science and then he must draw his own conclusions. Any other attitude would be equally as unreasonable as to permit the atheist to read the scriptures and to tell the believer what they mean. Yet this is not unlike what has been done in the past. The believer has seldom provided himself with an in-

timate, first-hand knowledge of the findings of science; on the other hand, he has often relied upon the interpretations of his enemy.

To properly fortify himself, the believer must not accept secondhand information, especially when it passes through the disbeliever. The field of research contains a wealth of testimony regarding the divinity of religion and the immanence of God, but unless the believer knocks, the door will never be opened to him. Nature will not turn the sincere investigator away empty handed.

The believer, therefore, should never regard science as anything other than his staunchest friend. By far the greater part of the so-called "scientific" arguments that have been raised against theology consisted of personal interpretations rather than of truly scientific doctrines. The vital point is that the believer must be prepared to go to the field of research and to select the wheat from the tares, to choose the one and to discard the other.

From a slightly different point of view, the believer must learn to look upon his religion as an exceedingly real and tangible thing, as something based upon the operation of law just as fully and as completely as anything else in the universe. When the Lord makes promises, the

believer must see to it that the requirements are complied with as strictly as if he were performing an experiment in chemistry or in biology. Deity does not answer personal petitions unless all of the conditions upon which they are predicated are complied with. Insincere or even half-hearted devotion does not merit the blessings that are allotted only to the faithful. Men do not learn the real value of the arts and the sciences by viewing them from a distance or even by passively participating in them. The secrets of chemistry or biology become known only to those who faithfully apply themselves to the study of these subjects. Religion is not different. Its value can be understood only by those who are unselfishly willing to investigate its claims and to comply with its teachings.

Misunderstanding of the reality of religion is responsible for the erroneous notion that belief in God entails very much more faith than is required in any other human activity. Because of this attitude, religion is often regarded as a kind of intangible thing, especially in comparison with physical subjects such as, say, chemistry and physics, yet it is extremely doubtful that religion requires its adherents to take any more for granted than does science itself. The fundamentals of chemistry are based upon the

supposed existence of molecules, atoms, electrons, and probably even more minute particles. Virtually the whole theory of the transmission of light by means of wave action has, until recently, revolved about the hypothetical substance called ether, which at present is being gradually discarded in favor of a so-called magnetic field. Scientists everywhere accept the doctrine of organic evolution and yet the existence of the principle itself is inferred as a result of reasoning. Knowledge of electricity is derived from the effects of this elusive agency rather than from familiarity with the agency itself. The limits of our information concerning any subject are quickly reached, no matter in what direction we may travel; beyond this frontier lies the unexplored realm of the vast unknown.

Moreover, it is again doubtful that science is more easily demonstrated than is religion. The sincere believer claims to know his religion just as really as he knows other things in life. God has promised that those who do the will of the Father shall *know* of the doctrine. Those who come to Him must have faith; furthermore, they must be right. The author has in mind the case of a certain professor of chemistry who appeared before his students to demonstrate the action of sulphuric acid on com-

mon salt. Unknown to the instructor, some wag of a student had replaced the salt with sugar, and when the acid was added the expected results were not obtained. The trouble, of course, was soon detected and when the proper materials were used the demonstration was complete.

The incident has two points of interest in the present discussion. In the first place, the chemist must have had faith in the constancy of the laws of nature, otherwise he would not have made the effort. In the second place, the incident shows that faith alone is not sufficient. The chemist must not only think that he is right but he must *be* right before he can obtain reliable results. The same thing is true in religion. Faith is the fundamental cause of action, but the results are predicated upon strict compliance with law.

The believer, therefore, can approach Deity with full confidence of reward, provided, of course, that he himself performs his full part. If the blessing is not immediately received the supplicant is not justified in losing faith. The chemist set out immediately to rectify the cause of the failure. The believer should take a similar course. *Compliance* with law cannot fail to bring results.

There are times, of course, when the believer's faith is tried, and when he does not know what procedure to follow. At such times recourse to prayer is his safest guide; even then he may be required to wait for the answer. Deity does not seem to have designed that we shall always know immediately what to do. This is equally true of science and of religion. The element of time is a great ripener of wisdom.

Young people especially are impatient of indecision. The writer recalls the time when he felt it to be his imperative duty to decide at once the merits of the doctrine of organic evolution. Thanks to older heads, however, the day of the decision was postponed! Immature conclusions are the cause of much future regret and embarrassment. Many cases could be cited in which Christians have hastily accepted scientific dogmas, only to reverse their opinions later. On the other hand, the believer cannot justify himself in forever postponing decision. His duty is to manifest a vigorous attitude toward all matters of importance and to accept them when he is sufficiently convinced of their truthfulness.

Faith in God is sometimes abandoned because of its supposed disharmony with certain scientific theories; chiefly, perhaps, the doctrine of organic evolution, including the origin of

man. It should be borne in mind, however, that evolution attempts to explain merely the *modus operandi* of nature and that it never concerns itself with the question of a creator. The writer sees no reason for assuming that the doctrine of organic evolution is incompatible with belief in God; quite to the contrary, the operation of an infinite number of laws, all mutually interacting in such a manner as to bring about progressive development, is accepted by him as evidence of the existence of a guiding hand. Such a conception of the power of God is doubtless far more complimentary to Deity than the one in which He is pictured as accomplishing the work of creation with His own hands.

Finally, the Christian can rest assured that the laws of nature will never be out of harmony with faith in God. Future developments of science may cause the believer to modify some of his present conceptions of religion, since his comprehension of the Gospel of Jesus Christ is necessarily an imperfect one, and, therefore, subject to revision. The principles of religion, however, cannot change because they are eternal.